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Aims and Approaches of Religious and Spiritual Education

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Societal developments orient politicians and policy makers to recognize religion as an important topic in the public sphere. Inter-governmental bodies as well as governments emphasize the role of education in informing young people about religions and beliefs with a view to mutual understanding and tolerance. Kindergartens, schools and teachers, however, appear to find it difficult to embrace this societal interest in religion and education, and to re-orient their educational practices. The present difficulty that teachers face can be related to a divergence or even clash of aims and orientations. What should they aim for? In the education provided, should the main target be on the personal development of the individual (e.g. understanding religious and spiritual experiences) or societal goals (e.g. inclusion, social cohesion, citizenship, democracy, participation)? Is the distinction between education in, about or from religion and spirituality still helpful, or should we be investigating deeper and more penetrating issues? The present difficulty for schools and teachers of religious and spiritual education could also relate to divergence of educational approaches and methods. Neuroscientific insight would suggest that we need to engage both cognition and emotion (as well as sociality) to ensure the richest learning. In this dynamic, mosaic world there are many challenges for learning and education generally. Does recent research provide valuable insights into the desirability and effectiveness of various approaches? Based on recent empirical research, scholars will present their insights on the relevance and appropriateness of the dominant aims and approaches that characterize religious and spiritual education.
What should RE in Germany be about and how does religiosity fit into this picture?

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In secularizing Germany the aim of RE is under discussion. Which perspective do students take in this discussion who will become RE-teachers? Moreover, there is some evidence that religiosity does play some role in taking perspective. Does this notion count for students, too, who will become RE-teachers? To answer these questions, the aim of RE has been conceptualized according to Grimmitt’s dimensions as ‘teaching in religion’, ‘teaching about religion’ and ‘teaching from religion’. Religiosity has been conceptualized as attitude towards religion and religious practice, using the Post-Critical Belief-Scale to measure the attitude towards religion and operationalizing religious practice via attendance of Sunday service, personal prayer, saying grace before meals, and reading the Bible. 1828 first-year students, who will become RE-teachers (81% females; 72% Catholic; 29% primary school) filled in a questionnaire. Confirmatory factor analysis shows a quite good data-fit of the instruments in use. The students prefer an RE informing objectively about different religions (m = 5.09) and helping the students to develop their identity on the basis of religious stories and motives (m = 4.90). The denominational type of RE does get small approval only (m = 4.50). Further on, students who show a relativist attitude towards religion tend to prefer RE as objective information (? = .30). An orthodox attitude towards religion is an indicator for preferring the denominational type of RE (? = .21). A high performance of religious practice does count for denominational RE, too (? = .12).

Religious and Spiritual Education in Italy between tradition and new approaches

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The scope of Religious and Spiritual Education becomes a privileged place for reflection, for exercises and for activities designed to transform the encounter with the other in an enriching experience. We are aware that this meeting at first causes difficulty, the desire to denial until, sometimes, it resulted in a conflict. The present contribution aims to explain the results of a research about the Religious and Spiritual Education in the school and parish context in Italy. In particular, the paper will refer to two things topical: the changes taking place this year in the Christian initiation in the diocese of Padua and the choices that are made on teaching of Religion in the classroom when there are children with disabilities.

Religious and worldview education in pluralistic educational context

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This paper examines Finnish pupils’ experiences on encountering cultural and religious diversity in the school and their everyday environment. Particular emphasis is laid on the views of these children of different ages on the implementation of worldview education in their pluralistic educational context. The study utilized mixed methods, combining quantitative and qualitative data. It employed a survey (n=1301) and succeeding interviews (n=38). The respondents were pupils of grade levels 3,
6, and 9 in the Finnish comprehensive school; that is, the age groups of 9, 12, and 15. Additionally, multi-method data from kindergartens (age group 0-6) and preschools (age group 6) were utilized. The paper presents examples from the interview data, illustrating the diversity and plurality in the school context as well as both between and within families, peer groups, and the different social contexts in the children’s everyday life. The data also presents some of our survey findings, showing for example that in their pluralistic educational setting, out of the Finnish 9th grade pupils, over half (53%) see religious instruction at school as significant and 29% take a neutral stance to it, leaving 18% who do not regard it as useful. This is in line with the previous international studies such as the EU-wide REDCo study, noting that many children and young people still value the social context of the school as a ‘safe space’ for dialogue on religions and worldviews in the pluralistic societal setting.

A cognitive science perspective on learning and instruction in religious education

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In the present-day secularised society and pluralistic context the acquisition of religious ideas is problematic. How do children form their own ideas and conceptions when confronted by diverse perspectives? Cognitive science suggests that the ideas that are more readily accepted are those that accord most with human intuition. We conducted a research to find out which ideas on afterlife children of 10-13 years-of-age hold. Findings show that religious as well as non-religious children tend to think that after death bodily processes cease and mental ones continue. Findings also show that Protestant children notably are less inclined than other children to think that especially biological processes end (need to eat, breathing, heartbeat). One assumes that in RE these children are introduced to these complex concepts that could be termed ‘the doctrinal mode’. Implications for the educational practice of RE in the contemporary context are discussed.

Quality of teaching: Different theoretical orientations and empirical evidence

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This symposium is concerned with different theoretical orientations to quality of teaching. Studies providing empirical support to each approach are reported. The first approach takes into account the dynamic nature of educational effectiveness and refers to factors concerned with teacher behavior in the classroom. Five dimensions measuring quantitative and qualitative characteristics of each factor are proposed. Research evidence reveals that these factors and their dimensions can be classified into five developmental stages of effective teaching. The second paper argues for a model of quality
of teaching which refers to structure and efficient of classroom management, supportive classroom climate, and cognitive activation. The significance of these dimensions in predicting student achievement and motivational development is supported on learning theory, self-determination theory, and constructivist approaches to teaching. The third paper refers to results of a video-based study on the quality of whole-class discussions in German and Swiss classrooms and how this is associated with other dimensions of instructional quality and with student learning outcomes. The analysis is embedded into a framework of psychological didactics vis-a-vis current concepts of learning and instruction. The fourth paper is based on a review of literature that seeks to explore five key challenges in studying effective teaching: definition, perspective, characterization, measurement, and theorization. Studies providing empirical support to aspects of each orientation are presented and reveal strengths and limitations of each orientation. The symposium advocates the importance of establishing a comprehensive approach to study quality of teaching addressing generic teaching competencies.

Searching for stages of effective teaching: a dynamic approach

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This paper refers to a dynamic theory of educational effectiveness that is used to define factors operating at different levels which are associated with different learning outcomes. The paper is mainly concerned with the eight factors operating at classroom level which refer to teacher behavior in the classroom: orientation, structuring, questioning, application, modeling, assessment, classroom as a learning environment, and management of time. It is argued that an integrated approach to teaching is adopted. Teacher factors associated with both the direct and active teaching approach (e.g., structuring, questioning, application) and the constructivist approach (e.g., orientation, modeling-scaffolding) are included in this model. This model takes into account the contingency theory and refers to five dimensions (frequency, stage, focus, quality, and differentiation) that are used to measure the functioning of effectiveness factors. Moreover, the importance of searching for relations among factors operating at the same level is raised. Some evidence supporting the validity of the model at the teacher level is presented. These studies show that teacher factors and their dimensions are associated with student achievement gains in different learning outcomes. Data emerged from these studies also reveal that teaching skills can be grouped into five types of teacher behaviour which are discerned in a distinctive way and move gradually from skills associated with direct teaching to more advanced skills concerned with new teaching approaches and differentiation of teaching. Teachers exercising more advanced types of behaviour have better student outcomes. Suggestions for research on teacher education and professional development are drawn.

Teaching Quality and Practices, and Opportunity to Learn: latent vs. observable structures

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The paper introduces a model of teaching quality which comprises three ‘basic dimensions’ of teaching, namely (1) Structure and efficient classroom management, (2) supportive climate and socio-emotional environment, (3) cognitive activation by deep content and challenging tasks. These dimensions are conceptualized as ‘latent’ dimensions, which can be judged by trained observers (through ‘high inference ratings’) or, with limitations, student perceptions. Theoretically, the separability of these dimensions is based on school theory, while their significance in predicting student achievement and motivational development is supported on learning theory, self determination theory, and constructivist approaches, respectively. The three dimensions tend to be related to the coverage of content elements, and/or to certain observable practices implemented by teachers, however, the ‘latent’ structure is not identical to any ‘observable’ structure, such as frequencies of teaching practices, or content coverage (also called ‘opportunity to learn’, OTL). The paper discusses the relationship between OTL, teaching practices, and basic dimensions from a theoretical point of view, provides evidence supporting the triarchic model of teaching quality, and finally reports data from an international student survey allowing to check relations among these variables, and their incremental validity with respect to student outcomes.

Does quality of classroom discourse contribute to learning? A video analysis of mathematics teaching

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Based on a theoretical framework of Didactics (in the German sense) and teaching quality, results will be presented from a video-based, quantitative study on the quality of whole-class, co-constructive discussions in 38 German and Swiss classrooms (8th/9th school year) and how this is associated with other dimensions of instructional quality (i.e., coherence and clarity of presentation of content) and with students’ learning outcomes. Sociocultural theories have emphasized the importance of discursive activities in the classroom in which students can participate in constructing meanings and concepts. In addition, coherence and clarity of the presentation of the mathematical content is another important dimension of instructional quality. Although the significance of both dimensions with regard to students’ learning is theoretically and empirically supported, most empirical studies so far have focused on either one or the other. In all 38 classrooms, a three-lesson-unit on the introduction to the Pythagorean Theorem was taught. All whole-class discussions during the 38 three-lesson teaching units were coded on three different dimensions of the quality of discourse. Further data was available from previous analyses on the same database: The pedagogical content quality of the lessons was judged by two experts, based on a high-inference rating instrument. Students’ mathematical achievement, before and after the videotaped unit, was assessed using mathematical achievement tests. Results show remarkable differences with regard to the quality of the discussions. Multi-level regression showed that both, coherence and clarity of presentation of content, and the scale representing co-constructive quality of discussions, predicted students’ learning outcome.

Defining and measuring effective teaching: an overview of research and implications for policy

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This paper highlights key issues and findings about two related but distinctive topics, how we should define a teacher’s effectiveness and what we do know about effective teaching practices. It also seeks to identify the implications of this for policy makers in education and for improving classroom practice. The paper is based on an in-depth literature review of Teacher Effectiveness Research (TER) and also includes the study of inspection evidence that involves making judgments about teaching quality in schools (Ko & Sammons, forthcoming). It will illustrate the arguments with findings draw on recent research in England (e.g., Sammons et al., 2007; Day et al., 2007).

The Variability of the Object of Learning

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The intention of this symposium is to reflect some of the recent research focusing on the object of learning and the relation between teaching and learning. A main concern for the teacher, who takes the students’ perspective on the content of teaching and learning, is the different ways in which students may experience the focused content, or the object of learning. According to the phenomenographic research tradition, learning is an on-going exploration of the world as experienced (Marton 1981); and not constrained to the learning task itself as defined by the teacher; although the teacher may believes that the learners learn about one thing, they might learn about something else. This may be understood as that the object of learning is no longer regarded as an end product of the learning process for the students, but a start of a learning process beyond a specific teaching occasion. For the teachers, this may also be true, that what is learned and what are the conditions that must be met in teaching a course. Teachers seem to develop a better understanding of the object of learning during the course, both as subject matter knowledge and also of the capabilities related to the object of learning, which extend beyond the particular teaching occasion and contribute to teachers’ professionalization.

Teachers exploration and search for the external and internal horizon of the object of learning

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Within the phenomenographic tradition the object of learning depicts the capability that is to be learned by the learner (Marton & Booth, 1997). The object of learning can be defined by its critical aspects, since they are seen as necessary for the learner to discern in order to learn. The aim of this paper is to discuss the nature of the object of learning by investigating how its meaning can change as it is explored by teachers. We analyzed seven recorded meetings in which four teachers and a researcher discussed the nature of the object of learning while they were planning, analyzing and revising a lesson. We found that the meaning of the critical aspects identified changed for the teachers due to the discussion and analysis of the lessons and thereby the meaning of the object of learning changed also. From at first being defined, they later become refined and specified as the teachers acquired deeper understanding of the object of learning. Distinctions were made to separate out what was of significance for the object of learning and what is not (the objects external horizon). Furthermore, an exploration by the teachers was made of how different aspects relate to each other (the objects internal horizon). The findings indicate that qualitative differences in teachers’ experience of the object of learning emerge through the collaborative investigation.

Delimitation of a phenomenon in authentic contexts: the learner’s experience of contextual variation

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In reported learning studies of price, the phenomenon has been delimited by contested disciplinary knowledge. In authentic contexts the delimitation of the phenomenon may be different. In this learning study, we were interested to see if and how a disciplinary understanding of price prepares learners to engage meaningfully with the real world contexts in which they experience price. Two classes of high school students were taught a disciplinary understanding of price using a variation framework. The qualitative differences in their responses to questions about price were analysed and used to categorise individual responses. A further thirteen authentic situations involving price were introduced to the students and their interview responses categorised and tabulated to reveal the variation across the contexts, which was considerable in many cases. Rather than through a disciplinary delimitation of the phenomenon, in many cases their responses appeared to be better understood in terms of the way they framed the decision they faced. The findings suggest that an understanding of current high school economics may not support learners’ engagement with authentic contexts; may not appear relevant. It may be better to start with learners’ experience of authentic contexts. This could be achieved by having learners explore the variation in what Kahneman (2011) refers to as within-subjects mode in contrast with our everyday experience of between-subjects mode. We go on to explore how psychoeconomics may provide a more relevant curriculum for the 21st century.

Arts education through the lens of variation theory

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The aim of this presentation is to argue the case that (and illustrate how) the theoretical framework of variation theory enables an emergent development in the didactics of arts education and music education in particular. In line with the recent goal-oriented development in early childhood education there is a great need for shedding light on the content of learning in the arts, that is, what it means to know or be skilled at an art form, which is intimately related to clarifying what is the teacher’s role in this learning with clear implications for the development of teacher education. Analytical tools that are central to variation theory are highly productive to meeting the outlined need of understanding the content of learning in music (and other related subjects within the field of arts). These concepts are (i) the object of learning, (ii) learning as discernment, (iii) the second order perspective and (iv) patterns of variation. The empirical data that serves as illustrations in this chapter come from a Swedish research project aimed at exploring poetry, dance and music as objects of learning in preschool and the first years of primary school. The notion of learning as discernment is used to bridge the somewhat outdated dichotomy of ‘theoretical’ and ‘practical’ knowledge in these allegedly ‘practical’ domains of knowing.

A longitudinal study of progression in students’ knowledge in three accounting courses

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Previous research has illustrated the impact of Bologna reform on European Higher Education in a number of studies. Few studies emphasises the need to apply a learning oriented teaching approach that takes a student perspective on the subject matter to enhance students’ learning. There is a gap, since studies mainly investigate students’ achievements at separate occasions and not their knowledge development in study programmes. The theoretical framework of the study is phenomenography and variation theory. A sample of Swedish undergraduate students is investigated in a longitudinal study in accounting, a subject in the Business programme. Empirical data are derived from interviews during the students’ three years in the programme. The aim is to investigate the students’ knowledge development of a basic concept in accounting, investigated in students’ problem solving processes. Three conceptions were found the third year: (a) fragmented, insufficient knowledge, (b) algorithmic knowledge, and (c) the ability to make judgements, estimations and integration of the influence of contextual factors in problem solving. Two critical aspects of the accounting concept, efficiency and profitability, revealed the qualitative differences in students’ understandings of the concept. Results showed that about half of the sample had gained very good knowledge of the concept, while some had acceptable and a few had insufficient knowledge. The scientific implications refer to widening the students awareness of critical aspects of the learning objects, and the educational implications have reference to reorganized learning and teaching. Implications of findings are discussed and further research in the area is called for.

The role of self-regulation and self-perception in learning of high ability students

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The aim of this invited symposium is to bring together two different research traditions represented by two European research organizations: the study on high ability and giftedness promoted by the European Council for High Ability (ECHA) and the study on learning and instruction promoted by the European Association on Learning and Instruction (EARLI). We have chosen to present the current research on the role of self-regulation and self-perception in learning of high ability students. Erik De Corte will present research results related to the need to foster more self-regulation skills among high ability students who can benefit most from that kind of instruction. Kirsi Tirri and Elina Kuusisto will introduce a case study on international gifted science students’ self-perception on their learning process during My Camp summer program where students collaborated and shared their knowledge with each other in small groups. Petri Nokelainen will join the discussion on self-regulation with his sample of gifted vocational education students who took part in the international Olympics in their field. Heidrun Stoeger and Christine Sontag will present empirical results on the impact of a teacher-led intervention, implemented during regular classroom instruction and homework, on 4th-grade students preference for self-regulated learning. Our discussant Dr. Charlotte Dignath will reflect on these papers and the possibilities for the two research traditions on high ability and giftedness and learning and instruction to benefit from each other.

Connecting the study of giftedness with research on learning & instruction: case of self-regulation

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In this paper it will be argued that the study of giftedness and gifted education can benefit substantially from a better connection with and embedding in educational research in general and research on learning and instruction in particular. This will be illustrated with respect to self-regulation as a major component of adaptive competence in a subject-matter field on the one hand, and as an important characteristic of effective learning, thinking and problem solving on the other hand. Research has indeed shown that exceptional performances in a variety of domains involves a high degree of self-regulation of cognitive activities as well as of motivation. But there is also evidence that sophisticated self-regulation skills are not acquired spontaneously, but can be developed and learned from instruction. There is therefore a strong need for research aimed at the design and evaluation of powerful learning environments for fostering the acquisition of self-regulation skills in high-ability students. In this respect it will be shown that such work can build on previous design-based research.

What kind of learning is meaningful according to gifted science students? Case study from Millennium

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Elina Kuusisto
The aim of this study is to examine what kind of learning is meaningful to gifted science students. The study is a multiple-case study of five international students, who attended in summer 2012 the Millennium Youth Camp in Finland. The students belonged to the ICT-group, and consisted of one female and four males. All the students were interviewed before and after the Camp of their learning goals and experiences. The theoretical framework of the study is based on situated learning theory (Lave & Wenger, 1991), which acknowledges the importance of community of practices and learners as crucial aspect of learning process. Especially this study utilizes the criteria of meaningful learning: activity, intentionality, constructive, collaboration and authenticity (Jonassen, 1995; Jonassen, Howland, Moore & Marra, 2003). The results showed that gifted students are intentional, constructive and active. They were grateful for the support of teachers, parents or like-minded friends, still only the female student emphasized collaboration and social interaction as the main aspect of her learning. Male students’ experiences focused on learning with authentic and complex problems, which had been facilitating their abilities to reach the mastering level of the field of their interest. The study discusses the role of programs like Millennium Youth Camp in promoting meaningful learning and social and affective interaction of gifted science students.

The Role of Self-regulation in the Development of Vocational Excellence

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International vocational competitions in different skill areas (e.g., plumbing, hair dressing) are gaining increasing interest around the world. What started in 1947 as a small regional competition in Spain has now become the WorldSkills Competition (WSC), a world-renowned event that draws competitors and visitors from all over the world (56 countries currently participate in WorldSkills competitions). This mixed-method study investigates the role of Finnish Shizuoka 2007, Calgary 2009 and London 2011 WorldSkills competitors’ intrinsic characteristics (self-regulation) to their talent development with qualitative (n = 30) and quantitative (n = 64) samples. The results of the semi-structured interviews with competitors, their parents, trainers, and working life representatives showed that self-reflection (e.g., attributions, stress tolerance), volition (perseverance, time management skills), cognitive skills (development potential), and motivation (extrinsic and intrinsic) were considered to be the most important factors promoting vocational excellence. Characteristics related to volition, self-reflection, and cognitive skills played an important role in all three developmental stages of vocational talent (initial interest, perseverance, and mastery of the skill).

Improving highly intelligent students’ self-regulated learning and achievement during regular class

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In most cases, highly intelligent grade-schoolers do not spontaneously use self-regulation strategies during regular classroom instruction (Stoeger & Sontag, 2012). We present a teacher-led self-regulation intervention designed to work equally well for students of different cognitive abilities during regular classroom instruction and homework. In an empirical study we examined the impact
of this intervention on fourth-grade students’ (a) preference for self-regulated learning, (b) finding of main ideas in expository texts, and (c) reading comprehension. The 763 study participants were divided into three groups: (a) Students (n = 266) who received regular classroom instruction (CONTROL) were compared with (b) students (n = 268) who were taught text strategies (TEXT) and (c) students (n = 229) who were taught text strategies within the framework of a seven-step cycle of self-regulated learning (SRL+TEXT). Students’ cognitive abilities were assessed on the basis of an intelligence test. Both at posttest and at maintenance (11 weeks after the intervention), highly intelligent students in the SRL+TEXT intervention showed a stronger preference for self-regulated learning than highly intelligent students of the two other groups. They also found more main ideas over the course of the intervention and reached higher scores on a standardized reading comprehension test than students in the TEXT intervention. As the intervention’s efficacy was independent of the students’ intelligence, the assumption can be made that the intervention is appropriate for promoting highly intelligent students within the context of regular classroom instruction involving students of various abilities.

Trends in Support for and Analysis of Collaborative Learning - Part I: Support

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Collaborative learning is omnipresent in education, whether in face-to-face or in computer-supported learning settings. The topic has recently achieved a lot of research attention for two reasons: the expected potential of collaboration to promote learning, and the increasing importance of social competences and team work in many work contexts. Moreover, technological advances have opened new possibilities for, and afford new forms of collaborative learning. Research on collaborative learning has centered around two broad questions: 1) How to optimally design support for collaborative learning? This question is of central importance, as it is long known that collaboration will only unfold its potential for enhancing learning if certain types of socio-cognitive processes occur in the interaction. 2) How to analyze collaborative learning data? Analyzing data from collaborative settings creates many challenges because the learning processes, and thus the data, of the collaborating partners are closely intertwined. This adds to the common challenge of taking into account both process and outcome data in analyzing learning. This invited double-symposium of EARLI SIG 6 (Instructional Design) and SIG 7 (Learning and Instruction with Computers) comprises a set of four presentations on each of the two thematic strands, featuring comprehensive summaries and new trends and innovations of recent research. Both sets of presentations will be completed by discussions of leading researchers in the two fields.

The Impact of CSCL Scripts on the Acquisition of Knowledge and Skills: A Meta-Analysis

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Ingo Kollar
CSCL scripts are regarded as an effective approach to foster the acquisition of knowledge and skills in various domains because they structure the process of collaborative learning in ways supposedly beneficial for learning. Given the divergence of results in studies on CSCL scripts, a meta-analysis was conducted to investigate (1) the effects of CSCL scripts on domain-specific knowledge and (2) the impact additional domain-specific support has on the effectiveness of CSCL scripts, as well as (3) the effects of CSCL scripts on domain-general skills. Effect sizes taken from 13 studies involving 1563 learners were integrated using a random-effects model. We found (1) a moderate effect of CSCL scripts on the acquisition of domain-specific knowledge ($g = 0.36$), (2) a significantly higher effect of scripts on domain-specific knowledge in the presence of domain-specific support than in the absence of such support, and (3) a large effect of CSCL scripts on the acquisition of domain-general skills ($g = 1.07$). Thus, CSCL scripts can be recommended as instructional support for the acquisition of both domain-specific knowledge and domain-general skills. In addition, CSCL scripts should be combined with additional domain-specific support to achieve the best results on the acquisition of domain-specific knowledge.

**Using Intelligent Tutoring Technologies to Adaptively Support Collaborative Learning**

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Collaborative activities can facilitate student learning, but only when students work together in productive ways. An intelligent tutoring system that models student collaboration as it occurs and then provides tailored support has the potential to positively impact collaborative behaviors and learning. However, this adaptive collaborative learning support (ACLS) has not historically had much impact in classroom settings, potentially because it is difficult to implement. It is challenging to automatically assess relevant aspects of student dialogue, identify effective dialogue, and provide adaptive support with which students will engage. We have developed an adaptive system that supports help-giving during peer tutoring in high school algebra: The Adaptive Peer Tutoring Assistant (APTA). APTA supports both the content and manner of peer tutor help, and has been demonstrated to improve collaboration quality and learning over non-adaptive controls. Based on our experiences, we discuss three principles for improving the implementation of ACLS: understand the mechanisms behind why ACLS is effective, design support to deal with uncertain modeling and assessment, and integrate information about the learning domain in with collaborative support. We
review the state of the art in ACLS and present examples from our work on APTA that illustrate the importance of these principles.

**Why Are Dialogues Better Instructional Materials than Monologues?**

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Pairs of students who collaboratively observed a video of tutorial dialogues (between a tutor and a tutee) have been found to learn as much as the tutees in the video. Moreover, we have found that tutorial dialogues are better instructional resources than lecture-style monologues given by the same tutors. This talk addresses several factors that might make dialogue-videos a better resource for instruction than lecture-style monologue-videos. We analyzed potential factors from two perspectives. One perspective pertains to the content of the dialogues (such as whether more substantive responses are contributed by the tutees in the videos, and whether tutors’ gestures differ in dialogues versus monologues). Another perspective pertains to the behaviors of the collaborative observers, such as whether they interacted more and contributed more substantive comments while watching a video of dialogues than monologues. These differences in the content and the observers’ behaviors are then correlated with observers’ learning gains to see which factors may cause dialogues to enhance learning more so than monologues.

**Peer Feedback to Support Collaborative Learning: Unlocking the Promise Within**

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Effective and efficient collaborative learning (CL) requires some support. As such, decisions regarding the type and degree of support for CL are intertwined with decisions as to which CL processes and outcomes are considered relevant. Hence, support of CL is shaped by the assessment of CL; and vice versa. One assessment format with a promising potential for assessment of CL is ‘peer assessment’ (PA). PA is an arrangement where students evaluate a product or a performance of fellow students of similar status. PA of CL is increasingly applied to discourage free-riding and reward individual contributions, typically via quantitative formats (rating/grading) to assess the (cognitive) product and/or applied PA to convert group grades to individual grades. Most quantitative PA formats also include qualitative peer feedback (PF) comments, however, understanding the mechanism(s) as to why, how and to what extent the PF comments are processed has only recently gained more attention. The aim of this contribution is to unlock the promise of PF to support and monitor CL, which requires: an interactional perspective on PF, a deeper understanding of the multi-dimensional nature of PF-messages, as well as a deeper understanding of PF reception and subsequent application, including coping with PF that turned-out to be (or was perceived as) less-favourable than anticipated.

**Academic Amotivation: Why Don’t Students Study?**

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Motivation is widely accepted as an essential factor for both engagement and success within academic studies. Recognizing this, researchers have invested considerable effort in exploring students’ motivation for learning. Far less attention however, has been given to why students lack motivation for their studies. This is despite the fact that many parents, teachers and society in general are concerned with the failure of students’ to engage with formal education. This symposium responds to a general call for research into students’ maladaptive motivations for learning. The aim of this symposium is to address not only why students do not study but also the measurement of amotivation, and the effect of failing to study on family. The range of perspectives, theoretical and empirical, within the symposium will provide the audience with a broad understanding of where research in this field stands and the questions it seeks to address. Four distinct but firmly intertwined papers will be presented. The first paper approaches students’ failure to study from the perspective of the conflict between students’ studies and leisure alternatives. The conflict between, and stress on, parents and students resulting from procrastination is the topic for the second paper. Two methods of measuring Self-determination Theory’s conceptualization of amotivation and their effect on students’ motivated strategies are modeled and compared. In the final paper to be presented, a person-centered approach to analysis is taken and latent student groups are explored based on their study time and motivational regulation.

Motivational conditions and domain specific consequences of everyday action conflicts

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Students’ self-regulatory difficulties during studying may result from tempting alternatives in the leisure domain and vice versa. Motivational interference theory predicts that our experience and performance in any given moment does not only depend on the motivational characteristics attached to the current activity but also on those attached to dismissed alternatives. In an idiographic approach, 358 students reported on their self-regulatory impairment in situations of motivational conflict. Then, incentive structures of the focal activity and the conflicting alternative as well as students’ academic and social adaptation to college as indicators of optimal functioning in achievement and leisure domains were assessed. Roughly one third of the participants remembered
a situation where they decided for studying, work, or daily obligations and against leisure-related activities (i.e., want conflict). By contrast, half of the students remembered a conflict situation where they decided for leisure-related activities (hobbies, friends, family) and against achievement-related activities (i.e., should conflict). In both conflict types, the strength of the incentives of the conflicting alternative predicted an incremental amount of self-regulatory impairment, yielding evidence for motivational interference. Furthermore, self-regulatory impairment in want conflicts was only predictive for the students’ academic adaptation whereas it was predictive for both students’ social and academic adaptation in should conflicts. The results show the negative motivational impact of conflicting alternatives on ongoing activities. This is not only the case for the academic but also for the leisure domain. Our research highlights the necessity for comprehensive models of learning motivation to consider non-academic strivings.

**Procrastination, Motivation, and Stress Experienced by Students and Parents related to Homework**

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Interactions related to homework are a major source of stress and conflict between parents and their children. This study aims to investigate various factors that can escalate the stress experienced by parents and students, including students’ motivation, the degree to which students tend to procrastinate about homework, and parents’ competence and their type of involvement in homework. Ninety-five dyads, each comprising a fourth-grade Jewish-Israeli student and one of his or her parents, responded to our survey. Using path analysis, the findings indicated a model in which parents’ stress regarding homework was associated with their own perceived competence and type of involvement, and the level to which their child procrastinated about homework. Students’ stress was associated with the parents’ stress, the type of motivation the student had, and the level to which he or she procrastinated about homework. Students’ type of motivation directly influenced the level of stress that he or she experienced, yet, the level to which homework was procrastinated had both direct and indirect influences on students. Procrastination stressed not only the student, but also the parent, and a stressed parent often results in a stressed student.

**Predictive validity of amotivation models: Relations with study strategies across eight months**

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The current study aims to build on prior theoretical and empirical research into amotivation, a component of self-determination theory (Deci & Ryan, 1985). The effect of two models of student’s amotivation on their approaches to learning and regulation of studies is tested longitudinally over
one academic year (eight months). Three dimensions of amotivation (ability and effort beliefs as well as task valuation) were validated and their longitudinal effect, both single higher-order latent variable and separately, on learning strategies were tested. Structural equation modeling was employed for construct validation and simultaneous regression. While both models fit the data acceptably, the higher-order factor model explained far less variance with respect to students’ reported study/learning strategies. Both models predicted adaptive and maladaptive strategies consistent with the negative nature of amotivation. External-regulation was the only strategy not to be significantly related to students’ amotivation. Despite the general amotivation latent construct fitting the data and predicting strategies significantly, the substantially higher amount of variance explained by individual dimensions suggests it is the more powerful model for understanding how students study; in particular, students’ ability beliefs had the most substantial effect on maladaptive strategies. The present results suggest that addressing the ability-belief dimension of amotivation should be the first target of any intervention with amotivated students.

Academic Motivation and Amotivation: the Interplay of Time Investment and Motivational Regulation

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In the first study 57 students of business administration in their first year were asked to fill out web-based time budget forms on a daily basis for a period of 5 month. The results showed that most students do not meet the planned workload and no statistical correlation between the applied study time and academic success were detected. In the second study was investigated if motivational regulation leads to a satisfying learning behaviour. As theoretical background served a comprehensive theoretical approach of action and learning which broadens the theory of action phases with specific elements of emotional regulation. 205 bachelor students of business administration filled out an online questionnaire including the 54 students from the first sample. Questionnaire Scales: Perceived Threat, Sensitive Coping, Acceptance of Responsibility, Outcome Expectancy, Self-Efficacy, Persistent Goal Pursuit: Maintenance, Persistent Goal Pursuit: Distraction, Goal Congruent Self Monitoring, Working with Peers, Generation of Positive Emotions, Effort Avoidance after Negative Emotions, Metacognitive Learning Strategies. In a 2-step-analysis process based on IRT methods, 5 pattern of motivational regulation were identified: Pragmatic Learning Motivation (26%), Strategic Learning Motivation (21%), Threat Oriented Leaning Motivation (20%), Negative Learning Motivation (17%), Self-Determined Learning Motivation (17%). The time investment and marks of these 5 types were as expected with one exception. The students with a negative learning motivation display surprisingly good marks and very high investment of learning time. This might be the result of a selection process and seems to be a very simple compensation strategy for amotivation.

Adaptive Teaching and Instructional Strategies in Classrooms to Address Diverse Learners

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Responsible teaching includes catering for diverse students’ needs. In their seminal work, Corno and Snow (1986) argued that ‘adaptive teaching’ (i.e. arranging environmental conditions to fit learner differences) is a key aspect of high quality instruction. To date, however, empirical research has rarely addressed the concept of adaptive teaching explicitly (Corno, 2008). This symposium brings together studies using both quantitative and qualitative methods to examine (a) the practices that teachers employ in order to deal with heterogeneity within classrooms and to address diverse learners’ needs and (b) the effects that these practices have on students. The first paper examines primary school teachers’ professional competence for adaptive teaching, comparing teachers with different levels of teaching experience. The second paper investigates the effects of a teacher training on instructional strategies to enhance diverse learners’ motivation. Results from three years of classroom observation show a close link between teacher support and student engagement. The third paper investigates a primary school teachers’ long-term realisation of scaffolding as adaptive support in a multilingual classroom, showing substantial effects on students’ language development. The forth paper presents an intervention study that examines the effects of different adaptive teaching approaches on students’ science outcomes in general and for students with different preconditions of learning, indicating that students with low language proficiency particularly benefited from formative assessment. Taken together, these presentations may stimulate an evidence-based discussion on how adaptive teaching strategies may foster sustainable learning even in heterogeneous classrooms by supporting students’ cognitive and motivational outcomes.

Cognitive Activation and Adaptivity in Novice and Experienced Teachers’ Videotaped Lessons

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As a result of the unsatisfactory effectiveness of Swiss teacher education, for the first time in the history of Swiss teacher education, standards were formulated which attempt to conceive teachers’ competencies in a concise manner. One of the standards relates to adaptive teaching. Our research project examined training and job experience oriented towards professional practice. Additionally, the impact of the first year in profession on novice teachers’ competencies was investigated, including those for adaptive teaching and for cognitively activating diverse learners. For the three years of primary school teacher education, the results show an overall increase in teaching competencies for each year. For the first year in profession no further progress in teaching competencies was found and the cognitive activation levels in the videotaped lessons seemed to be low. Due to this, tracing the quality of novice teachers’ competency to cognitive activate diverse learners adaptively became the focus in continuing the research project. Results to the following perspectives are presented: Teachers teach diverse learners adaptively. Teachers start teaching with informing learners about the goals of the lesson, the kind of activities they will carry out as well as by considering the fact that teaching refers to diverse learners in a heterogeneous class. The cognitive level in class discussions is high. Pupils’ contributions in the lessons mainly consist of long argumentation sequences. Adaptivity and cognitive level of problems and questions posed in the lessons are high.

How Do Changes in Teachers’ Instructional Behaviors Influence Student Engagement?

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We conducted a 3 year intervention with all the teachers at one middle school to increase student engagement. Teachers learned about 4 principles of motivation (supporting students’ competence, autonomy, belongingness, and making content meaningful) and instructional strategies that were consistent with these principles. Eight randomly selected teachers were observed 4 times a year for 3 years. Teacher instruction was coded from 0 (low) to 3 (high) on providing opportunities for competence, autonomy, belongingness and meaningful learning. Observers also coded student engagement (thoughtful student talk; students’ uptake of opportunities for collaboration and learning) on a scale of 0 (overt disengagement) to 3 (deeply engaged). Half the observed teachers increased their use of motivational strategies significantly from year 1 to year 2 and maintained them in year 3. Student engagement in these teachers’ classes also increased significantly from year 1 to year 2. The other half of the observed teachers maintained a low level of motivational support throughout the 3 year intervention with student engagement also low. The significance for policy is that a theoretically-based professional development project can help teachers use more effective instructional practices that result in a valuable outcome, increased student engagement. It also shows that change can happen fairly quickly (in year 2), and be maintained. The significance for practice is that teachers can and do change pedagogical strategies if they are do-able and if they understand the rationale. Nevertheless, as results for teachers who did not change practices demonstrate, this is a challenging endeavor for researchers and teachers alike.

The Long-Term Realisation of Whole-Class Scaffolding in a Diverse Classroom

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The form of adaptive teaching addressed in this presentation is whole-class scaffolding. Scaffolding, as adaptive and temporary support, has become a key concept in many educational areas. For example, to foster language development in multilingual content classrooms, scaffolding language in whole-class settings has been advocated as an adaptive key teaching strategy (Gibbons, 2002). To avoid the risk of loose use of the scaffolding concept in whole-class settings, we propose to use it only for teacher help with particular characteristics: diagnosis, responsiveness and handover to independence (Smit, Van Eerde, & Bakker, 2012). To promote whole-class scaffolding of mathematical language, a primary school teacher was encouraged to employ a repertoire of seven strategies (e.g., reformulating; asking for more precise language) in a multilingual primary classroom (22 pupils; aged 10-12). This paper investigates whether the enactment of these strategies intended to promote mathematical language development did lead to whole-class scaffolding as identifiable by its key characteristics, taking into account the long-term nature of much whole-class learning (e.g., language development). Comparison of pupils’ pre- and post-test scores on three linguistic key elements all yielded statistically significant differences with large effect sizes, thus confirmed handover. A statistically significant shift from high-support to low-support strategies revealed the teacher’s responsiveness to pupils’ levels over nine lessons. A qualitative analysis showed interrelatedness of performed strategies and scaffolding characteristics (e.g., diagnosis) over time. The results provide empirical evidence of the long-term realisation of whole-class scaffolding.
Teachers are challenged every day to adapt teaching to students’ diverse learning needs, and to provide particular support to students with difficulties in learning--to teach adaptively. However, adaptive teaching needs to be combined with domain-specific didactics. Within science classes, students’ language proficiency substantially affects learning through participation in science discussion. However, research on adaptive science teaching and its particular benefits for students’ with low language proficiency is still lacking. Using an intervention study, we specified two hypotheses: Adaptive teaching (1) supports students’ understanding of science concepts, and (2) reduces the effect of students’ differences in language proficiency on their understanding of science concepts. 54 German primary school teachers (participating with 1,070 third grade students) were randomly assigned to one of four conditions, i.e. three treatments (cognitive instructional support, CIS; peer-assisted learning, PAL; formative assessment, FA), designed to teach students adaptively, and a treatment control group (parental counselling). Teachers participated in workshops on a science curriculum and on the content of the particular condition. Using multilevel regression analyses, only students in the FA group showed significantly higher post-test outcomes than students in the control group while controlling for students’ preconditions of learning. Furthermore, results showed that only FA reduced the effect of students’ language proficiency on conceptual understanding. This study adds to educational practice and to research on adaptive teaching in science by showing that particular teaching approaches can provide additional support to students’ conceptual understanding.

Fostering self-regulated learning at school

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Teaching self-regulated learning at school is a challenging task. As previous research has shown training of self-regulated learning by teachers is less efficient than training by researchers. Based on this finding the aim of the symposium is to deepening the understanding of successful approaches for the implementation of self-regulated learning at school. The first paper addresses the role of personal attitudes towards self-regulated learning. The study examined primary school teachers’ beliefs about characteristics on both teacher and school level that affect the engagement in teaching self-regulated learning. The second paper deals with promoting primary school students’ self-regulated learning skills by creating powerful learning environments including learning materials, which addressed cognitive, metacognitive and motivational components of self-regulated learning.
The third paper focuses on an innovative web-based intervention program that aimed at improving self-regulated learning skills at secondary school. Including three intervention groups and a control group the study investigated and compared the effects of a student training, a teacher training and a combined training of students and teachers. The last paper examines the effects of a video-based pre-service teachers training program on the teachers’ skills to self-regulate their own learning behaviours and to teach self-regulated learning. To summarize, the presentations give some insights into supportive conditions and approaches of fostering self-regulated learning at school. The findings will be discussed subsequent to the presentations.

Primary teachers’ beliefs about influences on the promotion of self-regulated learning

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Research to date has extensively illustrated the contribution of self-regulated learning (SRL) to students’ success in both academic and later life. Despite primary teachers’ overall positive orientation towards SRL, several processes still impede teachers’ actual promotion of SRL in their classroom practices. The present paper examines teachers’ beliefs about characteristics on both the teacher and the school level to fully introduce SRL practices in primary education. Respondents were 127 teachers questioned through semi-structured interviews. Teacher characteristics, e.g. skill and will to stimulate SRL, were indicated as most influencing on SRL promotion as a result of teachers’ considerable autonomy in their teaching profession. Nevertheless, teachers also reported school level features to affect their engagement in SRL practices. A clear school-wide SRL policy, teacher collaboration across classrooms and schools and the integration of SRL practices with other school objectives were most often referred to. The study results provide input for the design of school environments facilitative to SRL development.

Development and evaluation of learning material to support self-regulated learning at primary school

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Based on the process model of self-regulation by Zimmerman (2000), the aim of the study was to promote a powerful learning environment for supporting self-regulated learning using learning materials for regular primary school classes. These learning materials focused on particular (meta-)cognitive and motivational components of self-regulated learning and were subdivided into six units. The study was based on a quasi-experimental pre-/post-control-group design combined with a time series design comprising altogether 493 fourth graders and 21 teachers. The intervention was evaluated longitudinally using a self-regulated learning questionnaire (34 items, all scales with Cronbach’s alpha > .60) as well as a standardized performance test before and after the intervention. In order to measure process data, the students of the experimental group were also asked to keep paper-and-pencil diaries (19 items) for a period of six weeks. The results of analyses of variance showed a significant interaction effect time * training for self-regulated learning, $F(3,459) = 3.79, p = .02, \eta = .02$, as well as the results of time series analyses revealed significant differences between the baseline and the intervention phase. Regarding the results of the performance test, no significant interaction effect time * training was found.

Evaluation of a web-based training program to foster self-regulated learning in Latin instruction

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The study’s aim was to evaluate a web-based intervention program, accessible via the online learning platform Moodle, to train self-regulated learning (SRL) and academic achievement in Latin. The effectiveness of intervention programs with regard to the support of SRL and academic achievement was shown by previous studies (Dignath et al., 2008). The concept of our study referred to the process model of SRL by Pintrich (2000) that divides the phases of the self-regulation process in different areas and components. The study had a quasi-experimental pretest-posttest-control-group design including the following instructional approaches: (1) student training (ST) (2) combined training of students and teachers (ComT) (3) teacher training (TT) (4) control group (CG). All approaches covered important self-regulatory and translation strategies. The intervention’s effectiveness was targeted on a sample of 213 students of 9th and 10th grade and was evaluated longitudinally by using a SRL questionnaire as well as a standardized Latin performance test. The results of analyses of variance showed a significant interaction effect time * training for SRL ($F(3,209) = 9.34, p = .00, \eta = .12$) and translation competency ($F(3,203) = 4.51; p = .00; \eta = .06$). Regarding SRL, the intervention groups significantly outperformed the CG. Additionally, we found that the ST showed higher self-regulatory competencies than the ComT in the posttest. In terms of the translation competency, results revealed that the intervention groups outperformed the CG as well as that the improvement of ComT was not significantly higher in comparison to the other intervention groups.

Using videotaped practice to promote SRL among pre-service teachers in their learner/ teacher roles
The study focused on central important questions: How can we promote SRL in pre-service teachers’ learner and teacher roles in a pedagogical setting, and how can we measure SRL in these roles? Ninety-seven Israeli pre-service teachers (PSTs) participated in a mandatory course as part of a two-year pre-service training program for primary schools. Participants were exposed randomly to a reflective training course (28 h), with either explicit reflective support (RS) or no SRL support (NS). The participants practiced SRL in both roles using a SRL training through web-based pedagogical exercises. Four measures were used to assess pedagogical SRL in both the learner and teacher roles: (a) SRL use in learner’s role was assessed with self-perceived pre/post questionnaires and colleagues’ feedback on real-time teaching, (b) SRL use in teacher’s role was assessed by videotaping participants’ SRL behaviors in real-time teaching experience and graphs were used to illustrate SRL changes. The findings indicated that the RS group outperformed the NS group in using most of the SRL components as both learners and teachers during a real-time teaching experience. The study offers an important contribution to pre-service teacher training, focusing on improving their SRL skills as learners and teachers and using a multi-dimensional approach to SRL assessment.

Mind the gap! Studies on the development of the rational number concept. Part I: Analysis

Many authors have argued that number sense develops very gradually and to a large extent implicitly. This symposium focuses on one case where research identified a gap in this gradual development: the transition from natural numbers to rational numbers. Research in cognitive-developmental psychology and mathematics education has repeatedly shown that a major source of difficulty in the learning of rational numbers is the interference of natural number reasoning, a phenomenon that is also denoted ‘natural number bias’. Students implicitly or explicitly assume that the ‘behaviour’ of natural numbers also applies to rational numbers, which leads to systematic errors. Some of these errors diminish with age and level of instruction, whereas others are remarkably persistent. In mathematics education, the gap between natural and rational numbers is hardly dealt with explicitly, and a long-term perspective on the development of the rational number concept in order to bridge this gap is rarely taken. Contributions to the symposium summarize research conducted on various utterances of the ‘natural number bias’, using a wide variety of tasks and methodologies, and involving diverse age groups. This is the first part of a symposium consisting of two parts. In Part I, empirical studies are presented that analyse the interference of natural number knowledge in a variety of mathematical tasks (algebraic expressions, fractions, decimals) and age groups (from lower secondary students to expert mathematicians), and point to potential
explanations. Papers in Part II will then point toward possible ways of overcoming the natural number bias.

**Are secondary students hampered by the natural number bias when interpreting algebraic expressions?**

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A major difficulty in solving rational number tasks is the inappropriate application of natural number knowledge, a phenomenon called ‘the natural number bias’ (Ni & Zhou, 2005). In this study, the aspect of operations was investigated. A number of rules related to operations with natural numbers are not longer applicable in the domain of the rational numbers (for example ‘multiplication and addition always make bigger’ and ‘division and subtraction always make smaller’ (Hasemann, 1981; Vamvakoussi et al., 2012)). Students further tend to substitute literal symbols in algebraic expressions only with natural numbers (Christou & Vosniadou, 2012). In this study we investigated if and to what extent students who are just introduced into expressions involving literal symbols suffer from the natural number bias, and particularly when these algebraic expressions address the effect of the four basic operations. The design of this study consisted of two paper-and-pencil tests whereby the students had to judge the correctness of a series of 40 algebraic expressions. The central question for each expression in the first test was ‘can this expression be true?’, whereas in the second test it was ‘is this expression always true?’ In both tests, evidence for the natural number bias was found in the significantly higher accuracies on congruent items (whereby interpreting the letter as a natural number leads to a correct answer) than on incongruent items (whereby interpreting the letter as a natural number leads to an incorrect answer).

**Reverse natural number bias in decimal comparison tasks**

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We report two studies which investigated whether educated adults exhibit Natural Number Bias (NNB) in the context of decimal comparisons (e.g. which is bigger, 1.2 or 1.159?). Like Vamvakoussi et al. (2012) we found a reverse NNB: across two experiments participants judged, for example, 3.4 to be larger than 3.254 more often than they judged 3.454 to be larger than 3.2. In other words there was a bias towards judging decimals with more digits to be smaller than those with fewer digits. However, critically, this effect was only present when participants were asked to compare one- and three-digit decimals, not when they were asked to compare one- and two-digit decimals. We propose a relevance-based account of these findings, and suggest that NNB does not influence all aspects of how adults deal with rational numbers.

**The representation of fraction magnitudes and the whole number bias reconsidered**

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Three experiments investigated the whole number bias in the representation of fraction magnitudes in adults. Two of the experiments were conducted with Carnegie Mellon University undergraduates while the third experiment involved undergraduates from the computer science department at the University of Athens. A fraction comparison task was used in which half of the fraction comparisons were consistent with whole number ordering - the whole number parts of the fraction were larger than the whole number parts of the opposing fraction - while the remaining half of the fraction comparisons violated whole number ordering - the whole number parts of the fraction were smaller than the whole number parts of the opposing fraction. The results showed the expected distance effects for the fraction magnitudes in all three experiments, indicating that the participants were comparing fraction magnitudes and not numerators or denominators. However, the participants were more accurate and faster to respond when the fraction comparisons were consistent with whole number ordering compared to the comparisons that violated whole number ordering. The results suggest that the participants exhibited whole number ordering interference when they were making judgments about the magnitudes of fractions. The implications of these results for a theory of fractions development will be discussed. This research has been co-financed by the European Union (European Social Fund, ESF) and Greek national funds through the Operational Program ‘Education and Lifelong Learning’ of the National Strategic Reference Framework (NSRF) - Research Funding Program: THALIS, UOA-70/3/11608.

Are expert mathematicians biased by natural numbers in fraction comparison tasks?

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School students’ difficulties with fractions can be due to an inappropriate application of natural number knowledge. This ‘natural number bias’ manifests itself for example in the belief that 1/4 is larger than 1/3 because 4 is larger than 3. Recent studies showed that even adults are biased by natural numbers on fraction comparison tasks, suggesting that intuitive processes are involved that can hardly be suppressed. However, these studies involved either special cases of fractions (with common components), item sets that were not controlled for numerical distances, or participants with no particular expertise in mathematics. Therefore, it is still unclear whether the natural number bias is generally found in fraction comparisons, and whether true experts in mathematics have overcome the bias. The present study investigated expert mathematicians’ performance on fraction comparison tasks in a reaction time experiment. First results show that although almost all the tasks were solved correctly, there was a natural number bias in terms of longer response times for specific items. In line with previous findings, the natural number bias occurred with pairs of fractions with common components, suggesting that intuitive processes cannot be overcome when the focus is on
the natural numbers involved. However, with fractions without common components, no natural number bias was found, presumably because other task features influenced performance to a much greater extent. The findings suggest that drawing learners’ attention to specific task features may be important, as it seems impossible to fully overcome the natural number bias for special cases of fractions.

Mathematical and Thinking Skills Interventions for Low Performing Children

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The 21st century set high demands on children. They should for instance be able to access and analyze information efficiently and critically. These competences require well-grounded basic academic skills. The aim of the symposium is to investigate the pedagogical possibilities to support the learning of low-achieving children who are at risk for later learning difficulties. We focus on cognitive and mathematical skills, which predict well later academic performance. The current state of art in the field of developmental psychology and education emphasizes the need for intervention studies. Our symposium includes experienced groups from four countries who introduce their latest research findings. The intervention approaches used were computer-assisted interventions, small-group practising and conceptualized early childhood activity intervention. The interventions focused on early numeracy skills, thinking skills or working memory components. In one intervention, motivational aspects were also included. Students were kindergarteners or first graders. All of the studies applied pre- and post-test design with intervention and control groups. Our symposium allows a discussion on the challenges and benefits of the different approaches. Different types of intervention studies offer several possibilities for systematic improvement to cope with challenges in early childhood and school environment.

Low performers benefit especially from computer-assisted preschool early numeracy interventions

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The effectiveness of a two computer-assisted interventions in preschool was studied on sixty-one children with a pretest-intervention-delayed posttest-control group longitudinal design. In this group, 16 children were low performers on the TEDI-MATH. Especially the effect on these low performers in preschool was studied and compared with the effect on the other children. Children in the experimental number comparison group and children in the experimental counting group in preschool performed better than children in the control group on the delayed posttest in mental arithmetic and number knowledge assessed 6 months later (in grade 1). Low performers especially
did better after the interventions. However the other children in the intervention conditions also had better scores on mental aritmetics and number knowledge compared with the control group of age-matched peers. Implications for the approach for children at risk are considered. Low performers benefit especially from computer-assisted preschool early numeracy interventions.

**Accelerating early numeracy: intervening by a contextualized approach**

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Children’s performance varies enormously with regard to early numeracy. Early numeracy refers to child behavior in preschool that indicates sense for numbers, being able to count and to use numbers, and using mathematical words such as size, space, time, more and less. Studies show that young children develop skills with regard to numeracy long before formal mathematics education starts. Since these studies up to now inform mainly about ways to design interventions that suggest the existence of a one-way relationship between instruction and learning, a contextualized approach was chosen. That allowed room for consideration of variables that were found in the studies mentioned before. The aim of the study was to accelerate early numeracy by activities related to this skill in kindergarten in order to achieve better preparation of students for formal mathematics education. A contextualized approach was used to prepare the intervention. This included pedagogical climate, teacher efficacy and child motivation. An intervention control group design was used that included these factors to contextualize activities that were then offered three times a week for eight weeks. Acceleration of numeracy was found in the higher mathematical performance of the intervention condition as compared to the control condition, as well as improvement of child motivation. The results of the analyses of the videotapes also revealed more time on task. Especially when contextual factors are taken into account, teachers succeeded better in embedding activities during the school day.

**Thinking and Mathematics Skills Interventions for the Low-Performing First Graders**

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This paper reports results of the two studies on thinking and math skills interventions targeted for the first graders. The aim was to detect the effectiveness of the intervention on inductive reasoning, fluid intelligence, math skills and reading comprehension and fluency. In study 1 there were 34 children located in two schools. In study 2, children of the intervention group (n = 6) are located in one school. In study 1, children of the intervention group took part in 12 training sessions (of 40 minutes) designed to promote general thinking skills and inductive reasoning. The same thinking skills intervention accompanied with math skills intervention (12 training sessions of 40 minutes) will
be repeated in study 2. In study 1, the intervention group had greater gains in inductive reasoning tasks and it was found that statistical differences between groups in pre-test disappeared in delayed post-test. Study 2 is ongoing but by EARLI 2013 we will be able to show results from all measurement points.

An Updating Approach for Improving Working Memory

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Despite the wealth of information on the relationship between working memory capacity (WM) and children’s mathematical performance, the extent to which limitations in WM can be ameliorated is unclear. There is also insufficient evidence on whether improvement resulting from WM intervention will have facilitative effects on children’s academic performance. In two studies, we examined the efficacy of a computer-based intervention programme that targeted a core component of WM: the ability to update. Updating refers to children’s abilities to retain, refresh, and operate on information in their immediate memory. Although children in the first study (N = 73) were enrolled in a learning support programme for mathematics, both their WM and mathematics were no different from their normally achieving peers. At an immediate post-test, the intervention improved their performance on an updating test, but no more so than improvement observed in an active and a passive control group. The second study targeted the same population, but included only children with lower WM scores (N = 91). The intervention programme ran for 4, 5 weeks during which children played the games for 30 minutes, 3-5 days a week. Each child attended 20-25 training sessions. Post-testing is on-going, but preliminary results showed that children who performed better on the mathematical and intelligence pre-test measures also tended to perform better in the intervention programme. This finding suggests that children with different abilities may benefit from the programme differently.

Rethinking Learning from Animations

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Because animations are increasingly relied on in technology-based learning materials, it is clearly important that they be as educationally effective as possible. Despite widespread faith in the explanatory power of animations amongst instructional designers and classroom practitioners, research shows their educational potential too often remains unfulfilled. This been attributed to the distinctive processing demands that animations can impose on learners due to their dynamic character. Interventions introduced with the intention of improving learning from animations (such as techniques borrowed from static graphics) have proven only partially effective. For example, even when visual cues are successful in directing learner attention within animations, they do not necessarily result in significant learning gains. Two approaches for improving animation that remain relatively unexplored are (a) making fundamental changes in the way animations are designed, and (b) allowing learners to make better use of existing animation designs. The theoretical and empirical contributions in this symposium highlight the need for a fundamental rethinking of the way educational animations are designed and used. On one hand, the symposium challenges the dominant animation design orthodoxy that referent subject matter should be depicted faithfully as an entire, fully functioning system showing all the dynamics involved. It will be suggested instead that animations should be designed in ways that better accord with learners’ perceptual and cognitive processing of dynamic information. On the other hand, the symposium addresses the issue of how opportunities to apply suitable strategies can support learners in handling the challenges that confront them in processing animations effectively.

Supporting processing of differently oriented 3D functional anatomy objects with animation

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Animation is widely used in instructional materials to represent dynamic systems changing continuously over time. Another use of animation is to provide a continuous series of points of view of an object in the three spatial dimensions. Such animated 3D visualization is believed to support learners in the construction of a mental representation of the 3D object, which is particularly important in domains like functional anatomy. Is animation really helpful for this purpose? How should animations be designed in order to support learners with various spatial abilities? This paper reports two experimental studies conducted with university students learning functional anatomy. The first study compared animated instructional material depicting the structure and behavior of the scapula with a static version of the same content. Learning tasks included the recognition of parts, rotations and orientations of the scapula. The second study investigated the effect of displaying orientation references (internal axes, external character or none) in learning the 3D structure of two anatomical objects, with expected effects of learners’ visuo-spatial abilities in mental rotation and perspective-taking. The results of the first study showed no main effect of the conditions on performances, although the animation group was locally more accurate in performing some rotation
Aging and learning from animations: executive functions, spatial abilities and presentation speed

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The present study investigated possible effects of executive functions of working memory and spatial abilities decline with aging on comprehension of a complex animation. Two animation presentation speeds, fast versus slow, were compared with two groups of young and old participants. Four executive functions were assessed: inhibition, shifting, information updating and speed of processing. Spatial abilities were measured with the DAT test. The upright piano mechanism animation was presented ten times successively. Eyes movements were registered. Although the animation was not controllable, initiation of each exposure was self-paced. At the end of each exposure, the piano remained static until the participant restarted the animation. Three aspects of the comprehension were tested after the learning session: (i) configuration, (ii) local kinematics (both multiple choice tasks) and (iii) quality of the mental model built (written production task). Results showed the comprehension was worse for the older participants. However, this effect appeared mainly for the mental model quality measure rather than for the configuration and kinematics measures. This suggests that comprehension problems for older participants arose with intermediate rather than earlier processing stages identified in the Animation Processing Model (Lowe & Boucheix, 2008). Although significant differences between young and old groups were found for executive functions and spatial abilities, regressions on comprehension showed only a significant effect of DAT indicating that the effect of aging on mental model building was moderated by spatial abilities. Although presentation speed had no effect, it is possible that this was due to application of a compensation strategy.

SALT – A ‘Strategic Animation Learning Tool”

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In order to enhance learning from expository animations, Kombartzky, Ploetzner, Schlag, and Metz (2010) developed and empirically evaluated a strategy for cognitive learning. Two quasi-experimental studies demonstrated that making use of the strategy significantly improved learning. In order to implement the strategy in classrooms, the traditional approach would be for students to undergo a long lasting-training program. Instead, we have developed and implemented the computerized tool
SALT (Strategic Animation Learning Tool). SALT guides and supports students in utilizing the learning strategy as proposed by Kombartzky et al. (2010). A quasi-experimental study with 150 sixth-grade students is currently underway to investigate the learning effectiveness of SALT. Two factors are varied in the study: (1) the availability of the different learning techniques (not available vs. available) and (2) the way that learners can capture selected frames from the animation (screenshots vs. abstract drawings). While screenshots offer a convenient way to capture frames of an animation, we hypothesize that enabling learners to generate their own drawings supports a more beneficial learning. Four different versions of SALT were created based upon the respective experimental conditions. Students in a fifth control group will only be provided with a video player. Learning gains are assessed on the basis of pre- and posttests. To ensure equal usability of all versions of SALT, usability tests for each version were carried out with 6th-grade students. The results of the different studies will be presented at the EARLI conference.

Principled animation design: A key to improving learning

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Despite concerted attempts by researchers to improve the effectiveness of educational animations, their potential to benefit learning remains in dispute. This theoretical paper argues that problems concerning a lack of effectiveness lie not with animations per se but rather with the way animations are currently designed. Prevailing intuitive approaches to animation design produce a faithful portrayal of the entire referent system and its operations. However, this comprehensive depiction of the subject matter can conflict with the characteristics human information processing and impose excessive demands on learners. To date, intervention research on ways to make animations more effective has involved adding ancillary support or modifications. However, such interventions can be seen as merely addressing the symptoms of a far more fundamental problem: how the animations to which they are applied were designed in the first place. To address this problem, we offer an alternative and principled design approach based on the Animation Processing Model (Lowe & Boucheix, 2008) that targets the composition processes by which learners construct mental models. By presenting the subject matter incrementally and cumulatively via pre-determined ‘relation sets’, the composition approach relieves learners of the need to decompose comprehensive animations. Because it is better matched to how learners process dynamic depictions, this approach offers a way of designing animations that results in high quality mental models and better learning. The theoretical derivation of the composition approach to design and its practical implementation will be discussed using example animations.

How teachers’ professional vision translates into teaching action

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Aims. A growing body of research on teachers’ professional development draws on the concept of professional vision as teachers’ ability to highlight and interpret relevant features of classroom teaching. It refers to the thought process teachers use in the midst of teaching. Studies focusing on the interplay between thoughts and teaching action are still rare. All four projects in our symposium center on this question. In a first study an empirical literature review about the use of classroom videos by prospective and experienced teachers highlights the relation between their thoughts and teaching actions. In the following three presentations the relation between pre-service teachers’ professional vision and classroom actions is investigated. In study 2, standardized teaching situations were analysed with regard to teaching quality of pre-service teachers and the relation to professional vision. Similarly, study 3 reports findings from a comparison of two different mathematic methods courses (one of which builds on the idea of developing analysis and learning from teaching abilities) and their impact on classroom teaching. Study 4 focuses on supervisors’ professional vision and ways they observe and guide pre-service teachers’ actions in the field. Scientific and educational relevance. In teacher education it is a challenge to foster the development of teaching skills that directly impact classroom action. Professional vision is seen as an important indicator for teacher’s expertise initiating teaching action in classroom. This symposium contributes to a growing body of empirical knowledge about the relation between professional vision and teaching action in professional development.

Visual teacher learning, review of a decade of research

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If the use of digital video (DV) for teacher learning is to be effective, it should be based on empirical evidence. Therefore, empirical studies reported since 2000 were reviewed regarding the results, processes and conditions involved in using digital video in teacher education and professional development. We conclude that visual feedback can make teacher learning more effective by helping teachers relate thought and action. We need to understand the dynamic relationships between teachers’ entry characteristics, the processes of perception, feedback, interpretation, reflection and enactment and their ongoing development. These factors are presented as components of the Visual Teacher Learning model.

Development of Standardized Teaching Situations for Pre-Service Teachers

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In initial teacher education it is an important challenge to support pre-service teachers’ acquisition of conceptual knowledge and to enable them to transfer this knowledge into teaching action. In this project we developed teaching situations as ‘approximations of practice’ for university-based teacher education to investigate pre-service teachers’ initial teaching skills in a standardized and contextualized way. The four teaching situations vary in the degree of classroom teaching complexity and topic of teaching. In this presentation, we focus on the pilot study of the project, in which the quality of implementation was tested. We investigated whether the developed teaching situations were implemented in an authentic way. N= 8 students participated as teachers, N = 10 trained students acted as simulated students, and N = 6 external experts evaluated the teaching situation (questionnaires). The implementation check with regard to authenticity referred to a) instructions, b) the action scripts for simulated students, and c) video recordings of the teaching situations. The findings show that experts, participants, and acting students agreed that the developed teaching situations represented authentic examples of teaching practice. Given the results, teaching situations were developed that are reduced with regard to the complexity of teaching but are still experienced as valid representations of practice. Based on these findings we currently use the standardized teaching situations for our main study with N= 89 pre-service teachers.

Pre-service teacher learning to teach: Analysis abilities make their way into the classroom

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This study investigates pre-service teachers’ learning to teach mathematics in the elementary classroom by comparing a video-enhanced methods course targeting the development of systematic analysis of teaching to a more typical course predominantly focused on strategies for teaching mathematics. Participants in the two courses were compared in terms of their analysis abilities and their teaching quality. The participants in the video- and systematic-analysis course outperformed their counterparts on both measures. These findings shed light on the relationships between professional vision and classroom practices and have implication for the design of math methods courses in the context of teacher preparation.

Investigating the Nature of University Supervisor’s ‘Noticing’ of Classroom Lessons

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An important goal for teacher preparation is developing prospective teachers’ vision of teaching practice (Feiman-Nemser, 2001). Current mathematics and science reform efforts in the US advocate for a model of teaching where all students have access and opportunities to learn mathematics and science in deep and flexible ways (NRC, 2001; 2007). Given these efforts, we propose that pre-service teachers develop a vision of ambitious instruction (Lampert et al., 2009; Sherin, 2007; Windschitl,
Thompson, & Braaten, 2009). One context in which future teachers can develop their vision of teaching is through interactions with university supervisors who observe pre-service teachers in the classroom and offer feedback on their teaching. This study investigates the nature of supervisors’ professional vision as captured in their noticing of teaching. We examine what supervisors attend to when observing student teachers, how they interpret these events in conversations with pre-service teachers, and the extent to which their comments reflect a vision of ambitious pedagogy. Analysis suggests that the supervisors focus primarily on issues of pedagogy and classroom management, privileging these aspects of teaching over content and student thinking and learning. Closer analysis of these two focus areas reveals that some supervisors attend to pedagogies for ambitious teaching, while others’ vision reflects a teacher-directed approach to instruction. These findings suggest that teacher education programs develop a shared language system for talking about teaching practice so that pre-service teachers can develop a coherent vision of ambitious mathematics and science instruction.

Enablers and barriers of productive learning dialogues: Where social meets cognitive

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There is a growing corpus of evidence on the benefits of students’ participation in structured academic talk with teachers, tutor and peers, showing that this type of instruction can increase students’ reasoning and learning outcomes (a/o, Resnick, Asterhan & Clarke, in press). However, it remains challenging to both elicit and sustain student participation in academically productive dialogue. Previous research on dialogic learning has been limited to examining cognitive antecedents and dialogic processes. More recently, scholars have become increasingly aware of the social, affective and motivational dimensions of learning through interaction (e.g., Baker, Andriessen & Jarvena, 2013). That is, examining the ways in which learners’ interpretations of self and others in interaction influences their willingness to engage and how they actually participate in dialogue. The present symposium brings together a multidisciplinary group of scholars who are pursuing this line of enquiry to discuss findings from recent studies that shed new light on the social barriers and enablers to engaging in academically productive dialogue. These studies investigate student engagement in dialogue in face-to-face and computer-mediated environments, examining the impact of social factors (i.e., identity construction, human presence, discourse goals, agency, social conversational agents) on learners’ epistemic and cognitive engagement in dialogue. Together these studies represent a range of perspectives on these issues, drawing on different methodological tools (experimental, discursive, ethnographic and computational) to examine the dynamics of academically productive dialogue.

Learning complex concepts through argumentation: the effect of human presence and discourse goals
In spite of its potential for supporting learning, and in particular knowledge revision, productive argumentation on science concepts is neither easily elicited nor sustained. Students may feel uneasy critiquing and being critiqued, especially on complex science topics. We report on a controlled study that tested the role of two potential factors that may relieve / aggravate some of these concerns: the partner’s argumentative discourse goals (competitive vs. collaborative) and belief in interaction with a human or a conversational agent. All students interacted in scripted, computer-mediated interactions with a confederate on their solutions to a topic they had just learned (i.e., diffusion). Students were led to believe they were either interacting with a human peer or a conversational peer agent. The peer confederate’s verbal behavior was tightly controlled and scripted to evoke argumentative discourse, while holding content exposure constant but differing in rhetoric style according to condition. Results from this study show the importance of collaborative discourse goals in learning from argumentation. Moreover even though previous studies have reported that the belief of interaction with a human peer benefits learning in consensual settings, we found the opposite for a setting in which the partner disagrees with and critiques the learner’s own solutions: Students showed higher learning gains when they believed they interacted with a computer agent as opposed to with a human peer. Implications for theory as well as instructional design will be discussed.

Identity Construction in Collaborative Learning – a Communicational Method of Analysis

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In this talk, a new ‘communicational’ lens will be presented whereby emotional, social and cognitive aspects of mathematical learning can be examined using a single, unified, set of operational tools. The main division we use when analyzing the activity that takes place in the mathematics classroom is ‘mathematizing’ (talking about mathematical objects) and ‘subjectifying’ (talking about the participants of the discourse). In order to extract ‘identifying’ activity (the construction of identities) from students’ talk, we categorize subjectifying utterances according to their level of generality, their explicitness and their ‘emotional hue’. We exemplify these analytical tools by comparing two episodes in which two groups of 7th graders (‘moderately achieving’ and ‘high achieving’) were engaged in solving non-standard mathematical problems. Though both groups encountered hurdles in mathematical communication, an excess of identifying activity in the moderate achieving group hindered efficient mathematizing while the absence of such activity in the advanced group allowed a smooth process of learning.

Conversational Agents for Promoting Productive Classroom Talk

Gregory Dyke
Traditional conversational agents (computer tutors) have focused on cognitive support for students working on their own. We present our research into conversational agents which provide social scaffolding in a computer discussion activity, encouraging students to build on each others’ ideas, to listen to each other and to achieve more depth in discussion. We discuss our results in terms of learning gains and show how these activities also promote increased productivity in subsequent teacher-led classroom discussions. We report on the difficulties and benefits both in using computers for discussion scaffolding and in focusing on social scaffolding more than cognitive scaffolding.

**Understanding Student Engagement in Classroom Dialogue**

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There is a growing corpus of evidence on the benefits of students’ participation in structured academic discourse. These studies show that engaging in academically rigorous discourse can increase students’ scientific reasoning skills and learning outcomes. We refer to this kind of discourse as Accountable Talk (Resnick, Michaels, & O’Connor, 2010). Some students, however, may initially find it difficult to engage in Accountable Talk discussions, in which their emergent thinking is made visible and leveraged for whole class learning. This paper reports on an interview study that examines students’ perceptions of the enablers and barriers of engaging in teacher-led Accountable Talk discussions. We examine the relationship between learners’ conceptualizations of dialogue, their sense of agency and observed engagement. The findings suggest that students attribute their engagement in Accountable Talk discussions to both environmental factors and personal attributes.

**Generating working life competencies during higher education**

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The symposium provides research-based definitions, empirical research, and suggestions for curriculum design and policy making on modern academic working life competencies. The academic working life competencies encompass several dimensions. First, there are the traditional academic competencies such as reading, writing, critically examining and contributing to scientific knowledge. Several researchers investigate these with a tight connection to the deepening of domain-specific knowledge, understanding its guiding principles, and the practices of working as a reflective expert in the field. However, research has highlighted domain-independent aspects of competencies. The generic competencies have been specified, e.g., to include critical thinking, self-managed learning, problem solving, adaptability, communication skills as well as interpersonal skills and groupwork (Kember, 2009). Finally, the environment where the future graduates will operate in is characterised by a rapidly changing job market with new types of employment and technologies. From a societal perspective, it appears, therefore, important to foresee, already during higher education, worklife requests for flexible, self-managing, and multi-skilled employees (De La Harpe et al, 2000), with agency to renew their knowledge and technology literacy. The four presentations will address theoretical definitions and empirical evidence on the promotion and development of these competencies from various perspectives and with various methodological approaches. The implications for the design of curricula and study programs draws on lessons learned both in the applied and research universities and workplace studies on how the development of working life competencies should be filtered into the entire curriculum in addition to specialised ‘one-shot’ courses.

Mapping the terrain of modern knowledge work competencies

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Academically educated people work in conditions where problem-solving skills, competences for collaborative innovation and the ability to use digital technology are needed. This creates demands for higher education: besides theoretically oriented and domain-related competencies, also these, often practical competencies, should be acquired during studies. In order to investigate what are these new competencies, and especially the novel knowledge work competencies, we conducted a review for which research articles were searched from EBSCO, Eric and SCOPUS databases. Altogether 79 articles describing the necessary competencies and skills to be developed in university studies or required from graduated students in work life were used for analysis. Based on an analysis of the terms used in the articles, five major categories of the work life competencies were created: knowledge, person-related, collaboration-related, organizational, and other competencies (like ICT). Only a few articles focused on new knowledge work, such as networking or collaborative learning. In general, the terms were often used vaguely, in passing and uncritically, without exact or clear definitions. It is necessary to investigate the new knowledge work competencies more profoundly in
authentic contexts in order to define relevant meanings for the terms, thus serving also higher education teaching practices. Key words: Higher education, work life competencies, review

The relation between learning approaches, motivation and workplace climate for knowledge-workers

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This paper investigates individual differences in the learning approaches and motivational regulations of knowledge workers and their relationship to the workplace climate. Knowledge workers (N=224) were questioned using inventories for measuring learning approaches, motivational regulations, and workplace climate. Descriptive analyses indicate that, in general, knowledge workers are autonomously motivated and prefer a deep learning approach at work. Partial correlations demonstrate that regulations indicating autonomous motivation were related to the deep learning approach. The results identify a significant link between introjected regulation and surface-disorganised learning and between amotivation and surface-disorganised learning. The influence of the workplace climate on learning approach and learning motivation was explored by means of a multivariate multiple regression analysis and Pearson correlations. The results indicate that workplace climate has a small to moderate influence on the learning processes of knowledge workers. According to our findings, knowledge workers who experience good supervision and sufficient choice independence tend to be more autonomously motivated to learn at work. A lack of motivation (amotivation) can be prevented by ensuring good supervision in the workplace. Knowledge workers who experience sufficient choice independence and who have a heavy workload appear to make more use of a deep learning approach. In contrast, knowledge workers who experience a heavy workload and inferior supervision largely prefer a surface-disorganised learning approach at work. Knowledge workers who experience less choice independence in the workplace prefer surface-rational learning. Results indicate that workplace climate affects the quality of learning and motivation at work for knowledge workers.

Classical and transversal cognitive skills in individual occupational careers

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In a highly complex working environment, individual adaptions on changing demands are necessary and are now an integral part of everyday work life. Thus, education does not end with formal school education, but continues over the entire lifespan. Transversal skills, especially complex problem solving, become therefore increasingly important beyond classical cognitive skills such as intelligence. In this paper, the influence of classical and transversal skills on career development over lifetime was examined empirically. A change in the importance of different skills was observed during several phases of career development. Whereas classical cognitive skills play an important role in early education, transversal skills mainly influence subsequent phases of education. Implications for managers in companies and educationalists are outlined.

Developing university courses for promoting students' knowledge work competencies

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Higher education institutions should aim to educate academic experts who master profoundly their own field, its core contents and methods, but also more generic skills in relation to the needs of society. The present research examined 1) how university teachers re-designed their pedagogical units to promote students’ knowledge work competencies, and 2) how the participating teachers and students experienced the new practices. The theoretical background draws on the trialogical approach to learning, emphasising collaborative knowledge creation supported by digital technology. Multiple case study approach and mixed-method strategy was applied in data collection and analysis, in order to capture the complex phenomena in authentic settings. Multiple types of qualitative data (stimulated recall interviews, reflective questions, observations and database content) were collected. The data sets were analysed qualitatively using an abductive strategy: continuous dialogue between theoretical presumptions and data. The analysis of the pedagogical designs revealed that the investigated courses included broader themes, increased amount of process-based and collaborative tasks, a more diverse use of technology, and more collaboration with work-life representatives compared to teachers’ previous courses. Teachers also considered alternative ways of student assessment (self, peer and group evaluation). Preliminary results indicate that teachers found it challenging to find new functional ways to structure and guide students’ collaborative activities, especially technology-mediated. Students generally appreciated the pedagogical practices (e.g., responsible collaboration and work-life contacts) although a few students had doubts about teamwork.

Achieving sustainable development and change in complex higher education contexts
Globally, the challenges of addressing complexity and sustainability within higher education contexts have led to increasing calls for the enhancement of teaching, learning and assessment. Traditionally, this enhancement agenda has been managed internally by institutions offering formal professional development programs for staff. Such programs are often facilitated by central units designed to support the development of department-based academics. These programs have been shown to have an impact on individual teachers (e.g. Gibbs & Coffey, 2004; Hanbury, Prosser & Rickinson, 2008; Ho, Watkins & Kelly, 2001; Postareff, Lindblom-Ylõnen & Nevgi, 2008; Trigwell, Caballero-Rodriguez & Han, 2012). However, the design of these programs, the contexts in which academics teach, and the individual academics themselves, can affect the depth and breadth of the impact of development activities. The research in this symposium investigates strategies for sustaining and enhancing the development of academics in a number of separate but related contexts. All presentations support the notion that university teaching practice is complex, and that a failure to address this complexity within professional development strategies limits their impact. The presentations discuss findings in relation to how professional development could be enhanced by addressing elements of this complexity. This might be achieved by developing sustainable strategies, such as those which support staff navigating change in adverse departmental cultures (Trautwein, Germany), engaging with dialogue around the critical area of enhancing assessment (Deneen, Hong Kong), encouraging informal conversation about teaching within departments (Thomson, Australia) and managing development in the contexts of workgroups and significant networks (Roxén, Sweden).

The complex interplay of influences on academics’ development in teaching

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Although improving teaching in higher education has become a global concern, systematic research into how different influences interact in academics’ development in teaching is scarce. Hence, the present study investigated development processes in teaching of eight academics enrolled in professional development programme. A qualitative, longitudinal design with three sources of data at two stages of the programme was employed. Thematic analysis following a grounded theory approach revealed changes concerning seven areas of teaching and learning. The largest clusters were changes in concepts of teaching and learning, the teaching persona and teaching strategies. As most common initiators of changes teaching practices, teaching courses and meta-cognition emerged. Through analysing the co-occurrence of change areas and change initiators multiple
pathways of change emerged, e.g. linking meta-cognition and changes in concepts. Furthermore change-impeding factors, e.g. lack of courage, were found. Based on these findings it is suggested that teaching development of academics should not be viewed or approached as an isolated measure but as one factor in a complex interplay of influences in academics’ development in teaching. Implications for academic development are discussed, such as development programs drawing on critical incidents in academics’ immediate practices and actively supporting the conjunction of change facilitating factors.

**Dialogue and the contested space of enhancing assessment in higher education**

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Achieving enhancement of assessment in higher education is a challenging proposition, but an imperative of global concern. The focus of enhancing assessment is however a contested space. Scholarly research on assessment recommends an emphasis on formative enhancement; tertiary administrations and external bodies, however frequently emphasize an accountability orientation. While not exclusive to each other, these differing priorities create a challenging space for institutions and professional development units attempting to enhance assessment practices. This paper explores this complex space within the context of an institution-wide professional development initiative. 35 instructors, 672 undergraduate students across 12 departments, six developers, and three senior administrators were participants. Looking specifically at assessment, data from multiple participant interactions was collected. The focus of data analysis was on dialogue, an area of recognized importance to understanding educational communities, but not commonly utilized to understanding assessment change. A sequential iterative coding process was used to analyze this data resulting in a hierarchical/relational coding framework. Significant findings focus on relationship between dialogue patterns to resistance and acceptance of change. Connections are also explored between dialogue patterns and institutional power structures. The apparent use of showcasing assessment practices as a covert defensive mechanism is also analyzed. Implications for both theory and practice are discussed. This includes a focus on the use of dialogue to better understand assessment enhancement, the need to account for impact of specific language use, and how negotiating the implicit and explicit power contexts of dialogues may be necessary to understand and achieve assessment-oriented enhancement.

**Informal conversation with departmental colleagues: A professional development strategy**

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Despite the frequent occurrence of conversations and their inherent potential for learning, informal conversations are not yet recognised as a strategy for developing academics in universities. The current study explored the nature of informal conversation between academics within the context of university departments. This study provides evidence that conversations are a practical, informal way for academics to learn about teaching from colleagues, and as such, they represent a form of learning that is complementary to formal professional development programs. In addition to summarising the nature of informal conversation, this presentation will offer suggestions for building on formal professional development programs by encouraging informal conversations.

**Conceptualising collegiality – how professional development influences the collegial context**

Torgny Roxa
Despite the resources invested in various ways of professional development activities aimed at influencing university teachers’ ways of teaching, research on how effects from these activates spread in higher education organisations have been limited. This contribution discusses how these effects may propagate from the individual teacher and into a more collegial context. It uses a socio-cultural perspective and identifies and compares workgroups and significant networks as interesting loci for further research on organisational effects from professional development activities. These conceptual constructs contribute to a needed theoretical debate concerning the transfer of professional development effects beyond the individual teacher.

Blended Learning in Higher Education: a framework, evidence-based practices and tools

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Recently there has been much interest in the potential of ‘blended learning’ in higher education (Bonk & Graham, 2006; Garrison & Vaughan, 2008). Blended learning is often defined as a mix between face-to-face and online learning. Although definitions vary, we can say that in general ‘blended learning’ refers to a well reasoned use of ICT in the learning process, with emphasis on ‘learning’ instead of ‘teaching’. In this symposium we will present results of research on ‘blended learning’ in higher education with the aim of realizing responsible teaching and sustainable learning within higher education. Mrs. Alebaikan presents results of research on a theoretical framework, composed of five themes that are considered key factors in formulating a blended learning framework that can be used in Saudi universities. Ms. Ligorio et al presents results of research on the ‘Blended Collaborative and Constructive Participation’ (BCCP) Model, the alternation of individual, group and community activities as essential for the design of sustainable learning contexts. Mr. Swager presents research results on a tool for redesigning teaching practices: the ‘Redesign module interaction and feedback’. The module aims to redesign instruction-focused face-to-face teaching practices into teaching practices that can be characterized as teaching practices with meaningful interactions based on blended learning, with a high chance of a successful execution. Mr. Poldner et al presents results of research on a powerful instrument of feedback in blended learning: using screencasting technology to produce audiovisual feedback on student teachers’ reflective writings.

A blended model combining individual, group and community development

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In this contribution the Blended Collaborative and Constructive Participation (BCCP) is presented. The model is inspired to theoretical indications drawn from constructivism and collaborative learning and it is devoted to university students. In this model, the alternation of individual, group and community activities is considered as essential for the design of sustainable learning contexts. Through two instruments - the Blended Effectiveness Perception (BEP) questionnaire created ad hoc and the Scale of Sense Of Community in online Courses (SSCC), it was inquired the perception of efficacy of the model and the chances in the sense of community of 73 students. Data were treated with the Factorial Analysis (Principal Component method), reliability test, t-Test, means and standard deviations. Results showed that students appreciate the group dimension as well as the logistic, the content, and the blended structure of the course. At the same time they liked also the self-management of the participation. All the dimensions composing the sense of community significantly improved after participating to the course. These results confirm that the combination and integration of the individual, group and community dimensions is a strategic lever to promote responsible teaching and the sustainable learning.

Perceptions of Blended Learning in Saudi Higher Education

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Blended learning has a great potential for the development of Saudi Higher Education. However, careful consideration of the concept of blended learning and pedagogy strategies is essential for promised outcomes. This presentation discusses a theoretical framework composed of five themes that are considered key factors in formulating a blended learning framework that can be used in Saudi universities. The ultimate aim of the framework is to outline the factors that influence the implementation of blended learning. Although this framework is specifically related to the implementation of blended learning in the universities of Saudi Arabia, I am confident that the assumptions and recommendations contained herein will be of great value to similar contexts.

Designing meaningful interactions based on blended learning

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In this contribution results of qualitative research on a tool for redesigning teaching practices are presented. The tool is named ‘Redesign module interaction and feedback’ (hereafter ‘module’). The module aims to redesign instruction-focused face-to-face teaching practices into those that can be characterized as teaching practices with meaningful interactions based on blended learning, with a high chance that the redesign is executed as it was designed. The research question that was central in this study: To what extent and how has the module contributed to an appropriate redesign and an adequate execution of the redesign? Data collection consisted of surveys, interviews and a implementation checklist. All discussions and interviews were recorded on audio file, ad verbatim transcribed, and additionally coded and analyzed by various researchers. Member checking was used in reports. It can be concluded that the module contributed to thinking in a structured way about the interactions and feedback activities and about the way in which ICT could support these. Also can be concluded that the module offered too little support with respect to the question of how the
students could be supported by the interactions and feedback actions and how the teacher could
guide this process.

**Reflection, Video and Screencasted Feedback: Lessons learned**

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It is commonly accepted that students in teacher education write reflective essays. The use of video footage related to the essays can assist student teachers in the process of reflective writing. This longitudinal study includes five students and a teacher of a university of Applied Sciences in the Netherlands who used screencasting technology to produce audiovisual feedback on student teachers’ reflective writings. Student teachers’ and teacher educator’s experiences and perceptions of providing and receiving screencast feedback and video footages were explored. During one and a half year for each semester of ten weeks, student teachers posted a reflective essay with video in a forum on a Virtual Learning Environment (VLE). They posted six reflective essays with video in total. They received typed feedback on the first four of the six essays from a teacher educator and peers. Screencasted video-feedback was delivered by the teacher educator on at least two posted essays of each student. The results show that students perceived the screencasted feedback as more useful, personal and helpful than typed feedback. Results of qualitative and quantitative content analysis of levels and content of reflection of the posted essays will be discussed.

**Quality Assurance with High or Low Pressure: School and Teacher Responses in Multiple Countries**

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Sandy Taut  
P. Universidad Catolica de Chile  
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Jose Felipe Martinez  
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Educational quality assurance comes in many shapes and sizes across national and local contexts. It may focus on specific groups of educational actors, schools as organizational entities, or some combination of the two. Its instruments vary accordingly, including student achievement testing, teacher performance assessments, and school evaluation focusing on educational outcomes and/or processes. Another important feature that varies across contexts is the amount of pressure and the nature of the consequences these systems attach to their results (Reezigt & Creemers, 2005; Santiago & Benavides, 2009). High stakes consequences (rewards, sanctions, publicized information, etc.) may force schools and educators to pay attention to audited performance, but may block identification with the established performance expectations. Low-stakes systems may more strongly appeal to educators’ intrinsic motivation and job commitment, but run the risk of being ignored as irrelevant. The power of extrinsic or normative consequences may interact with the technical quality of the assessment instruments, communication with external experts, and educators’ professional status. Designing effective quality assurance mechanisms depends on knowing how they work, both in terms of what is intended by policy-makers and what actually happens in practice. In this symposium we explore the role of ‘accountability pressure’ in such systems on achieving their intended consequences, as well as exploring unintended effects. By contrasting empirical evidence from high versus low pressure national contexts, the symposium investigates the interaction between quality assurance system characteristics, contextual factors, and observed consequences.

**Accountability and Performance Bonuses in Deregulated Charter Schools in the United States**

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Xiaoxia Newton  
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United States

This paper reports on Year II of an in-depth longitudinal case study of four schools’ responses to high-stakes systems of quality assurance in the United States. The schools have faced multiple high stakes incentives intended to motivate them to focus on teaching quality and achievement. Teachers in these schools are relatively young and for the most part highly engaged. Positively inclined towards performance management, they:. Favor pay for performance in general terms; Accept being measured; Clamor for visibility and feedback; Defy job insecurity and risk. At the same time, they are highly intrinsically motivated. Cohesion and trust among faculty members, including the principals, are high. Administrators, managing and evaluating instruction, play a minor role in teacher learning which flows from an internal dynamic of sharing among colleagues and collective wisdom. External quality assurance systems are oddly removed from this dynamic and at the same time quite powerful. State test scores, growth targets, lesson evaluation templates, and the like, in their specificity, are not seen as good instruments to motivate internal notions of instructional quality and are rejected as unhelpful in creating relational depth. Yet, precise measures, instruments, or standards outside the quality assurance instruments do not exist, leaving internal notions of quality to vague and imprecise intuitions, too diffuse to guide the learning process. Evaluation threat adds impetus to the usage of the tools and measures.

**High-stakes Teacher Evaluation in Chile: Professionalizing Teachers in a Perfect Market?**

Sandy Taut  
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Chile
This paper reports comprehensive evidence on the consequences of a large-scale, standards-based, multi-method and high-stakes teacher performance assessment system. Coming from a measurement and evaluation perspective, we started by identifying the intended interpretations, effects and uses of the assessment system by analyzing legal documents as well as performing stakeholder interviews. We then studied the intended as well as unintended effects and uses through a set of different studies and by applying a variety of methods. Our findings indicate that the assessment program achieved some of its intended consequences, while falling short on others. Important positive and negative unintended consequences were also present. While this mixed evidence could call into question the legitimacy of the assessment itself, we attribute its failures more to its high-stakes nature, while its successes occur in spite of the strong perceived pressure. When discussing these findings from a comparative perspective, it is important to consider the educational policy context in Chile as well as the assessment’s technical rigor.

**School Improvement in Low-stakes Testing Systems: Preconditions and Limits of Test Data Use**

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This paper aims at revealing how schools in Germany deal with evaluation data within a low-stakes testing system. By surveying principals, heads of departments and teachers, data use at different levels (strategic, curricular and operational) as well as interactions between those levels will be analysed. Preliminary results indicate that test data are mainly used for adapting lesson content at both the individual and departmental levels. Other forms of data use, such as adapting teaching methods are less common. Furthermore, it seems that principals have not nearly fully utilized the strategic potential of the data (e.g. for personnel development strategies).

**Does Accountability Pressure Through School Inspections Promote School Improvement?**

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School inspections have been implemented by many European countries as a mechanism to assure and promote the quality of their schools. However, national inspection systems vary in their elements, contextual features, and in the ‘accountability pressure’ applied, through, e.g., minimal thresholds, labeling of schools, and sanctions for failing schools. The paper uses online questionnaire data from approx. 3000 school principals in primary and secondary education in seven European countries (Netherlands, England, Sweden, Ireland, Austria, Czech Republic, Switzerland) to discuss whether or not the amount of ‘accountability pressure’ characteristic of schools systems and experienced by school principals contributes to more, less or qualitatively different development activities.

The role of contextual factors in beginning teachers’ professional development

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The first years of teaching are characterised by a sudden increase in the complexity of demands. Beginning teachers have to adapt the formal knowledge acquired during initial teacher education to the demands of the dynamics in their job situation. Professional growth is based on the interplay between individual characteristics (competencies, self-regulatory capacities, etc.) and contextual factors (local workplace, team structure, etc.). Accordingly, beginning teachers have to solve specific developmental tasks relating to the first years of teaching (Keller-Schneider/Hericks 2011). Our symposium aims to gain a deeper insight into the mutual interdependencies and interplay between beginning teachers’ characteristics and those of the professional context, from the perspectives of both beginning teachers and actors in the school system. The presentations address a) the impact of individual and contextual conditions on beginning teachers’ estimations of induction programs (paper 1); b) the interplay between individual and contextual factors in contributing to beginning teachers’ balancing of the demands of profession entry (papers 2 and 3); and c) the compatibility between the requirements and the actual givens of the work field regarding beginning teachers’ professional development (paper 4). The findings from our studies show implications for both teachers’ first years of teaching and the development of induction programs. They identify responsibilities of relevant actors in school system. Keller-Schneider, M. & Hericks, U. (2011). Forschungen zum Berufseinstieg. Übergang von der Ausbildung in den Beruf. In: E. Terhart, H. Bennewitz & M. Rothland (Hrsg.), Handbuch der Forschung zum Lehrerberuf (S. 298-313). Münster: Waxmann

The impact of induction programs on the development of beginning teachers

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Beginning teachers have to solve specific developmental tasks during their first years of teaching. Individual resources like knowledge, attitudes, motives and beliefs, as well as characteristics of the context have an impact on their professional development. In Switzerland specific induction programs support beginning teachers in mastering this important phase to solve the associated developmental tasks. How these elements have an impact on beginning teachers’ professional development is still not clarified. The presented longitudinal study, designed as evaluation of the newly implemented elements of these specific induction programs, is based on questionnaires. All beginning teachers between 2006 and 2008 were involved (n= 141). In addition also the mentors and principals were questioned. Results of the study show the development of beginning teachers concerning their competence in handling the demands and the amount of being stressed by. Results presented in this presentation show, how beginning teachers estimate different elements of the newly implemented induction program. Different types of preferences of use were identified by cluster analysis. Differences between these types, relating characteristics of context and the person, are proved by variance analyses. The degree of fit between beginning teacher and mentor, characteristics of the context and self assessed competencies (concerning the four developmental tasks of career entry) have an impact on using the different elements of the induction program and on the amount of considering them important and helpful.

**Similar challenge – different outcome: longitudinal study on newly qualified teachers’ professional development**

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The purpose of this study is to investigate the professional development of eleven newly qualified foreign language teachers and the outcomes of this process for their practical knowledge. The study is part of a longitudinal project at the University of Jyväskylä; (2002-2009). The study addresses three main questions: 1. Which experiences are significant for teachers’ professional development? 2. What characterizes the newly qualified teacher’s teaching?; and 3. In what way does the newly qualified teacher develop as a teacher? Eleven female teachers (aged around 25) were studied during the first three to four years in the profession. Data were collected through annual interviews, journal entries, and reflective essays. Data were analyzed using both content analysis and discourse analysis. Findings show that the majority of teachers adopted a reactive stance to their environment and constructed their teaching practices according to the norms, restrictions, and authorities of the environment. The teaching methods of these teachers were traditional, and differed considerably from their language teaching ideals. In contrast to these teachers, four teachers adopted an active and critical stance towards their environment and actively developed both their teaching and relationships to other teachers and pupils. This attitude enabled them to develop a holistic view of teaching languages. The study underlines the importance of language teachers’ agency in the process of their professional development. This places the concept of agency at the centre also in teacher education and in planning support during induction.

**The joint impact of individual factors and the mentoring context on beginning teachers’ professional development**

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The first years of teaching represent a crucial and potentially problematic period for teachers, influencing their subsequent professional development. Research has addressed especially the difficulties they face. More recently, the specific demands of this career stage have been conceptualised as developmental tasks to be mastered. The role of contextual factors, particularly the local school context, has not received much attention. To support beginning teachers’ mastery of the job entry, various forms of induction programmes have been established, with school-based mentoring representing a central feature since the 1980s. A growing body of literature indicates that mentoring beginning teachers can benefit mentees, mentors, schools, and educational systems, but that successful mentoring depends on a number of conditions. Broader mentoring concepts include peer or group mentoring, taking a more systemic view. This explorative study addresses the interplay between individual factors and the mentoring context of the local school and its impact on Swiss beginning teachers’ mastery of the first years of teaching. Nine beginning teachers aged 23 to 46 years (M = 27.1; 7 females) from different schools participated. Narrative interviews (teachers) and focus groups (teammates) were conducted. Regulatory documents were collected. The teachers and their school context were conceptualised as cases. Several crucial factors impacting both beginning teachers’ mentoring experiences and their mastery of profession entry were identified. These included the quality of the mentor-mentee relationship and the potential of team support to assume the function of group mentoring if that relationship was strained. Findings will be discussed from a systemic perspective.

Compatibility with the work field – a central category in trainee teachers’ professionalization

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In Germany trainee teachers are both fully responsible teachers and learners at the same time. Apart from interacting with students they also have to deal with their mentors’ expectations which can be different from their own ideas. In sum, they face challenges on three levels during their education: the professional level, the personal level, and the environmental level. Following the theory of learning by experiences, irritations (a lack of competence) or crises have to be accepted as a chance for competence development and growth. This includes the need for support and confidence in the trainers. The aim of the longitudinal study ‘professionalization in pre-service-training’ is the reconstruction of competence development. Nine trainee teachers were both interviewed and observed in their daily life at school. The data were analyzed using the documentary method. The results indicate that the interdependence between the compatibility with the environment (e.g. school, colleagues, students and mentors) on the one hand and the trainee teacher on the other hand influences their ability to face new challenges: accepting them, being open for experiments even under the risk of failure. Participants with a high compatibility showed more courage to make experiences which enabled them to develop their professionalism, whereas incompatibility caused inner conflicts and an avoidance of experiments. Case-studies reveal a stagnation of competence development.

Source evaluation and trust: Real matters in a virtual world

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Reflecting critically about the source of a document is a core element of critical thinking since the Enlightenment. Learners should be able to refer to the credentials of an author if they have to judge the plausibility of claims made in a text, albeit it has been often shown that several learners fail to do so (see below Rouet et al., Pluchino et al.,). The Internet offers all kinds of documents and all too often the question of plausibility cannot be solved by one’s own direct judgment about the truth of a knowledge claim. For example: A layperson searching the Internet for information about the impact of sun exposure on skin cancer or on climate change (see below Thomm & Bromme) has to use source information when she wants to judge competing knowledge claims. Source information will help the reader to answer the question ‘Whom to trust?’. Recent developmental psychology has shown that our understanding of the world is largely based on knowledge that we obtain from others and that such learning from others inevitably requires trust (Harris, 2012). Source evaluation is a means of judging whom to trust, and whom not to trust. The contributions to this symposium examine the cognitive processes, knowledge structures and personal variables entailed in source evaluation. In so doing the authors scrutinize a capacity, which has been in the focus of research on critical thinking before, but has become all the more important in the virtual world of the Internet.

Source Authoritativeness and Patterns of Eye Movement during Webpage Reading

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Learners should be able to evaluate the credibility of websites and the veracity of their content to follow up only accurate and supported information. This study aimed to investigate whether attention on the same information is allocated differently according to the authoritativeness of a webpage, and whether individual characteristics of topic-specific prior knowledge and epistemic beliefs moderate this process. We used eye-tracking methodology that provides fine-grained data about the amount of visual attention devoted to the same information offered by different sources, both in a quick, automated way and in a delayed, deliberate way. Thirty-nine undergraduates read four authentic webpages, comprising five types of information: URL, text 1, text 2, picture 1, and picture 2, which provided verbal and graphical information about the universal validity of the central dogma of molecular biology. The webpages were situated on a continuum from the most to the least
authoritative: institutional, encyclopedic, popular, and alternative. Findings indicated implicit source evaluation, as revealed by more automatic (first-pass fixation times) and delayed processing (second-pass fixation times), which varied according to source reliability. In the first-pass, greater attention was dedicated to the more familiar information within the most credible page. Readers also integrated more words and graphical elements when processing the information in the highly authoritative source during the second-pass reading. Data on individual characteristics ‘validate’, to some extent, data regarding the patterns of eye movement. In addition, crucial positive relations between integrative eye-movement patterns and web-based learning also emerged.

**Trustworthiness Judgments among Law Students Reading Multiple Documents on Climate Change**

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This study examined differences in and predictions of trustworthiness judgments when law students read multiple authentic documents on the scientific issue of climate change. First, it was found that students put more trust in information from a climate and environmental research center and from the national pollution control authority than in information from a newspaper and an oil company. Second, it was found that students’ topic knowledge, topic interest, emphasis on publisher, and emphasis on content differentially predicted the trustworthiness ratings of the four documents. In particular, the role of topic interest seemed consistent with the view that students’ trust in particular documents may be more dependent on their preexisting values and engagement than on their knowledge. Moreover, the law students’ use of publisher as a justification criterion signaled more advanced source evaluation than that found in other student populations. With respect to the newspaper article, emphasis on publisher and content seemed to work in opposite directions, with emphasis on the publisher negatively and emphasis on the content positively related to the trustworthiness rating of that particular document.

**Teenagers’ comprehension of multiple texts: The role of source knowledge**

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We investigated teenage students’ ability to identify specific source features in short text passages and to evaluate source competence based on a short description of an author implication. Our assumption is that students’ difficulty in assessing the quality of a document may be due in part to their lack of familiarity with the linguistic representation of source characteristics. 7th and 9th graders answered three questionnaires aimed at assessing their knowledge of source features, and performed a multiple document comprehension task. We predicted that students’ source knowledge would significantly predict their performance on the document comprehension task, after controlling for reading ability. Data had been collected and the results were being analyzed at the time of proposal.

‘Who might know, if I don’t know?’ Judging a Source’s Trustworthiness by its Pertinence

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To make knowledge-based decisions about daily issues, laypersons increasingly have to handle science-based information. While the Internet simplifies the availability of science-based information, the challenge lies in the evaluation of online information. Frequently science-based texts require conceptual understanding of complex contents going beyond a laypersons’ knowledge. They must evaluate the text’s source regarding its trustworthiness and pertinence (that is which expertise might be relevant) to the topic. Judgments of pertinence are not trivial, since science-based issues may be assigned to multiple expertise domains. We examined whether laypersons possess accurate assumptions about experts’ pertinence to science-based topics without holding knowledge about the same. Undergraduate students read online texts based on original science articles and estimated to what extent experts of different disciplines might have contributed to them. Accuracy of participants’ estimations was established by comparing the subjective pertinence judgments with bibliometrics of the articles. The relationship between the accuracy and knowledge measures was analyzed showing that participants had accurate assumptions about experts’ pertinence regardless of their prior knowledge. Since the deference to pertinence assumptions may represent a capacity to overcome one’s fragmentary understanding of science-based online information, its relevance for the evaluation of the trustworthiness of online sources will be discussed.

Challenges and benefits of technology-based testing in large-scale assessments

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Given the increasing importance of technology-based testing in educational large-scale assessments, e.g. in PISA, the symposium’s goal is on the one hand to address specific challenges when introducing technology-based testing; on the other hand it will demonstrate how measurement can benefit from using technology. We address this topic from four perspectives covering the issues of computerizing existing items, developing new innovative items to obtain valid measures, and analyzing product and process data collected in computer-based testing. In the first presentation, we look at the challenge to transfer PISA 2009 reading items from paper- to computer-based format; this includes the investigation of mode effects and their explanation by cognitive- and non-cognitive covariates. Second, we address how technology-based assessment allows to extend the assessment of traditional reading aspects as included in PISA by e.g. skills enabling to select hyperlinks with respect to credible online information. Third, we look at the assessment of complex problem solving competency, which necessarily relies on the use of technology, and how cross-national gender differences can be explained. Finally, the fourth presentation provides insights into how the inclusion of process data into data analysis extends our understanding of Digital Reading assessed in PISA 2009. By means of these four perspectives, the symposium aims to illustrate different starting points for technology-based testing and how it goes beyond paper-based assessment with respect to item development and analytical potential. The symposium will be completed by a critical discussion of the four presentations.

Analyzing mode-effects of PISA print reading including a comparison of time-related information

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Mode effect studies comparing paper-pencil and computer-based tests are necessary prerequisites for a transition to computer-based assessment in large-scale assessments of student competencies to ensure the validity of score interpretations and the cross-mode comparability, i.e. stable trend estimates for cross sectional assessments or the comparability of individual change scores for longitudinal assessments. In the present study cross-mode comparability of reading comprehension is investigated. As a national extension of the German PISA 2012 main study, items from the PISA 2009 reading assessment were administered in a randomized design to 15-year old students. Time-related information, gathered with the help of technology-based assessment by means of digital
pens, are analysed in addition to the evaluation of different criteria for the analysis of mode effects. In particular, two specific sources of mode-effects, within-test navigation and within-unit navigation, are focused, because the paper-based and computer-based reading tests differ with respect to these properties of test administrations. Descriptive results give insight into the test-taking process in paper-based assessments, relevant for the future computerization of tests measuring reading comprehension, and differences to the computer-based administration are considered as mode effects. Further explanatory analysis relate mode-effects for individual test-takers to additional covariates, particularly basic computer skills and test-takers’ motivation are related to the mode of test administration.

**Explaining hyperlink selection by PISA reading and cognitive component skills**

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Unlike linear print texts, hypertexts are usually not been structured and read in sequential order. They require the self-directed selection and ordering of text materials, and knowledge about specific text schemas and cues that indicate a text’s usefulness and credibility. The latter skill refers to the selection of hyperlinks to access a reliable information source. From the perspective of the PISA framework this evaluation skill relates to reading, especially the ‘reflect and evaluate’ aspect when reading electronic-medium texts. The major goal of this study was to explain hyperlink selection skill by PISA text-level reading skill and the underlying reading aspects as well as further relevant cognitive component skills. As part of the computer-based national extension of PISA 2012, the hyperlink selection skill and the various aspects of text-level reading were assessed in a sample of 852 German 15-year-old students. As cognitive component skills, basic computer skills, working memory capacity, and basic reading skills were included. First results show that hyperlink selection skill is explained by text-level reading, especially by the ‘reflect and evaluate’ aspect, basic computer skills, and basic reading skills, but not by updating.

**Determinants of cross-national gender differences in complex problem solving competency**

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Jonas Muller  
University of Luxembourg  
Luxembourg
In educational large-scale assessments, an increasing interest in measuring domain-general competencies such as complex problem solving (CPS) competency is observed. In the PISA 2012 cycle, CPS was assessed across the world partly using minimally complex computer simulations based on the MicroDYN approach. In this talk, we present empirical results on MicroDYN, a computer-based test containing multiple items aimed to measure two main complex problem solving processes - knowledge acquisition and knowledge application. More specifically, we examine cross-national gender differences in CPS competency and their determinants. A CPS test was applied to a sample of 890 Hungarian and German high school students attending 8th to 11th grade. Results based on multi-group confirmatory factor analyses showed that measurement invariance of CPS was found across gender and nationality. Analyses of latent mean differences revealed that males outperformed females and German students outperformed Hungarian students. However, these results were caused by Hungarian females performing worse than all other groups. Further analyses of logfiles capturing process data of the interaction of participants with the task revealed that Hungarian females less often used vary-one-thing-at-a-time (VOTAT) strategy. Results imply that analysing process data such as use of strategies is highly advisable to identify determinants of performance differences in CPS across groups of interest. Implications for research on CPS and possibilities for adjusting and extending the measurement device MicroDYN are discussed.

Effects of response times on task performance in digital reading are moderated by task complexity

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When students complete complex reading test items, their response times might either reflect efficiency of processing (efficiency hypothesis), or thoroughness of task engagement (thoroughness hypothesis), suggesting inverse associations with task performance. The efficiency hypothesis assumes a negative, and the thoroughness hypothesis suggests a positive association of response times and reading task performance. Both hypotheses were tested for the domain of reading digital text using data from the OECD PISA 2009 Digital Reading Assessment (N=31,401 students from 19 countries and economies). Analyses were carried out on the item level. Results suggest that the efficiency hypothesis holds for less complex digital reading items that pose only little navigation demands. For these items, a strong negative association was found between response times and performance. For more complex digital reading items in contrast, that pose high navigation demands, the thoroughness hypothesis holds. For these items, a strong positive association between response times and performance was found. The association between response times and performance in reading is thus a function of task complexity, and response times might reflect different kinds of processes, conditional on task demands. While in less complex tasks, they might be indicative of efficient reading processes, in more complex tasks, they might be indicative of thorough task engagement.
The Use of Questions in science classes

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This symposium offers an overview of how teacher’s questioning can contribute to the effectiveness of children’s science learning. The importance of questioning, especially in science lessons, is stressed, as well as the important role teachers play in stimulating curiosity and inquiry in the classroom. The collective goal of the presented research is to obtain insight in the way questioning and science learning are intertwined with each other, and to demonstrate the effects of good questioning in the classroom. Paper 1 demonstrates that open ended questions alone are not sufficient in a classroom: longer waiting time after an open ended question results in more successful answered questions. Paper 2 suggests that teachers who model being an engaged learner by pursuing their own scientific questions may elicit similar behaviour from students. Classrooms in which teachers ask questions with as well as of their students increase student exploration more than classrooms in a control condition. Paper 3 argues that interdisciplinarity between the three subjects is important when teaching mathematics, science and technology. Two selected cases are discussed in terms of types and levels of questions. In paper 4, the results of an effect study about teachers’ use of questions based on the empirical cycle during science lessons is described, as well as teachers’ own ideas about their lessons and questions. Overall, this symposium gives insight into the way questioning contributes to science teaching and the way questioning helps to create teachable science moments in which students are invited to show their talents.

Cultivating Curiosity in Science Activities: Effects of Teacher Modeling on Student Exploration

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Curiosity has emerged as an important predictor of academic success, but its expression is relatively absent from classrooms today. This study examines whether teachers could increase student expression of curiosity through the use of active modeling. Elementary school students worked with an experimenter on two science activities guided by worksheets. Participants in the Active Modeling condition scored more highly than controls on subsequent measures of curiosity: they spent significantly more time engaged with the study materials in the experimenter’s absence, and were marginally more likely to produce novel deviations during in the second activity. Active modeling appears to be a viable method for increasing student exploration, though underlying mechanisms, as well as application in the classroom environment, remain to be explored.
Teachers’ Expectations and Pedagogical Practices

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The enculturation of young children into science can be a difficult process not only for the learners but also for the teachers involved. This teaching-learning process demands that the teachers have sound subject content knowledge and also the pedagogical knowledge to translate the subject matter into something meaningful and appropriate for their pupils. In addition, teachers need to introduce the correct scientific terminology and also encourage their pupils to use these terms as they learn to ‘talk science’. In this paper we investigate the relationship between wait-time (conceived as a proxy for teachers’ ‘class expectations’), open questions asked by teachers (conceived of as a proxy for teaching-style) and open questions answered (conceived of as a proxy for the children’s enculturation into science talk). A regression analysis of data from one hundred and two lessons in twenty schools suggests that there is a relationship between these three variables, in particular the value of teacher’s expectations proxied by wait-time is identified as being significant in children’s enculturation into science. The implications for policy and practice are explored.

Teaching of math, science and technology in an interdisciplinary context: A cross analysis

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Implementation of interdisciplinarity in science education is still an actual challenge. It seems that integrative approaches and creating connections between mathematics, science and technology (MS&T) and other subjects (Samson, 2004; Hasni, 2006) by teachers are an issue. In a pilot study on teaching practices using by high school mathematics, science and technology teachers, questionnaires were sent out to over 71 MS&T teachers in the province of Quebec, to document their opinion on interdisciplinary settings in high schools in regard of their teaching practices. Interviews (N=8) were also conducted to better understand their perceptions regarding the challenges, limits and perspectives about teaching practices. In the context of this paper, our discussion will focus on a multi-case study (N =2) around interventions teachers of MS&T with their students. While we are in favor of interdisciplinarity, it seems that one of the main results that we wanted crosstab case used here shows differences in terms of teaching mathematics and science and technology. Factors such as the experience of teaching, training, time of planning are many things to consider and influence the scope and type of questioning. To promote interdisciplinary learning support sustainable, the teacher must adopt a more open posture and by questioning over his practice in general and more specifically about his actions and questioning.

Questioning in science education: the use of the empirical cycle with young children

Annemie Wetzels
When children go to preschool, they seem to lose some of the natural curiosity and interest in the world around them that they had before. In classrooms, teachers hardly stimulate this talent by asking no or the wrong kind of questions, which can lead to pupils’ diminished interest in Science and Technology (S&T). The aim of this paper is to describe the ingredients of an intervention program aimed at increasing teachers’ skills for stimulating inquiry and curiosity in S&T) lessons based on increasing their use of the empirical cycle to structure their S&T lessons. Second, it will evaluate the results of an intervention program for teachers, based on this framework, in which they learn how to use the empirical cycle in the classroom, and to promote teachable moments through posing questions. Teachers learned in an introduction session how to ask questions based on the empirical cycle and were coached during four subsequent science and technology lessons. Video analyses of the recordings of the participating teachers (7) showed a significant improvement in the number of questions concerning the empirical cycle asked during a lesson, compared with their own pretest as well as with the pre- and posttest of the control group (6). Our tentative conclusion is that it seems possible for teachers to teach science to young children without much science content knowledge by using the empirical cycle. Further research is needed in order to examine whether this leads to more curiosity and long term interest in Science and Technology.

Methodological issues in the analysis of interpersonal regulation in learning

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This symposium aims to discuss methodological issues in the analysis of interpersonal regulation. The need to explore this topic is based on the view that a group’s collaborative learning differs from an individual’s solo learning. Most researchers would agree that a group’s interpersonal regulation, also referred to as social regulation or socially shared metacognition, is a unique phenomenon (see Iiskala et al., 2011; Molenaar et al., 2010; Volet et al., 2013). However, the study of groups’ interpersonal regulation as both an individual and a social process lacks sophisticated methods of data analysis, and reliable methods are needed (Iiskala et al., 2004, 2011; Volet et al., 2009; Vauras & Volet, 2013).
All contributors to this symposium investigate groups’ interpersonal regulation in different collaborative contexts. In order to further advance this research, in-depth debate around a range of phenomena that drive current methods for analysing interpersonal regulation is crucial. One key issue is how different forms of regulation (i.e. individual and social regulation) are interrelated and therefore can most effectively be considered simultaneously. A second issue is the analysis of interpersonal regulation in different learning contexts (e.g. face-to-face, with and without technology, and in CSCL). In the symposium, four perspectives for the analysis of interpersonal regulation will be presented and discussed. The discussant will synthesise the major methodological challenges, leading to a greater appreciation of the challenges involved in investigating interpersonal regulation.

Development of a methodological approach to study social regulation in collaborative learning

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The purpose of this paper is to present the development and gradual refinement of a situative framework and derived methodological approach for the study of social regulation in collaborative learning. The study of social regulation in collaborative learning as it takes place in real time is a challenging task due to the complexity of capturing, analysing and representing the interactive and dynamic nature of this psychosocial phenomenon. Most empirical investigations of social regulation in collaborative learning involve the development of new schemes to code interaction data, or the revision of existing schemes to fit the data and research questions. Yet, how these schemes are gradually refined to address new research questions and advance theory, or alternatively contextualized to be more sensitive to data is seldom discussed. In this paper, we outline how our initial theoretical ideas and derived methodological approach to identify instances of productive forms of collaborative learning were relentlessly refined, and some aspects rethought, to address questions that could not be addressed with earlier formulations. The evolving methodological approach was validated through a number of studies conducted over several years. The insights about social regulation, gained at different points in the development of the methodological approach will be presented and illustrated, using coded transcripts of video data of university students grappling with complex clinical cases.

Self and social regulation in the primary school classroom: Methodological issues

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The purpose of the present paper is to address the main methodological issues in relation to the study of self and social aspects of regulatory activity when children are working in small groups in the classroom. For this purpose, we will present two studies, one with first year primary school children in the UK and another with third-fourth year primary school children in Chile. In both cases, we used a framework of analysis that combined coding considering two different units of analysis: (1) individual utterances and (2) interactional episodes. The advantages and difficulties of such methods are discussed, looking at three main categories of analysis: features defining episodes of shared regulation, types of activities promoting - or not - shared regulation and, the interaction between verbal and non-verbal data in the analysis of children's interactions.

**Metacognitive Activities Embedded in Interaction**

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In this paper, we explore the way metacognitive activities are embedded in the interaction among the group members. Collaborative learning research indicates that the quality of collaborative learning is positively influenced by level of interaction. The questions examined in this paper are: 1. How are metacognitive activities embedded in the interaction among the group members? 2. Does shared attention among the group members facilates higher levels of interaction? 3. Do higher levels of interaction impact the function of the metacognitive activities? We found that metacognitive activities can be embedded of in different levels of interaction: ignored, accepted, shared and co-constructed among the group members. Moreover, the provisional role of shared attention was confirmed. When the group members share a particular focus in advance of a metacognitive episodes, they are more likely to engage higher levels of interaction around the metacognitive activities. Finally, metacognitive activities embedded in higher levels of interaction (from ignored to co-constructed ) were more likely to facilitate the group process. Therefore, we propose a framework for studying metacognition during collaborative learning which specifies the way metacognitive activities are embedded in the interaction of the group members.

**Analysing socially shared metacognitive regulation in dyadic face-to-face and small groups’ CSCL**

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Empirical evidence of metacognitive regulatory processes as self- and socially-regulated systems is scarce (Iiskala et al., 2011; Volet et al., 2009, 2013). In this paper, the concept of ‘socially shared metacognitive regulation’ (SSMR) is used to refer to the consensual regulation of joint cognitive processes in collaborative learning (Iiskala et al., 2004, 2011; Vauras et al., 2003). The research questions are 1) how SSMR is manifested and 2) what functions of SSMR do appear in dyadic face-to-face collaborative learning and small groups’ CSCL processes. STUDY 1 comprises four dyads (10-year-old pupils). The dyads solved face-to-face 251 mathematical problems over 56 lessons. Problem-solving sessions were videotaped, and verbal/nonverbal behaviours were transcribed as turns (N = 14675). STUDY 2 comprises six small groups (12-year-old pupils, n = 25). The groups solved science problems in a CSCL environment over 22 lessons. The pupils generated notes (N = 4771). A set of turns/notes was used as a unit of analysis. The findings indicated that SSMR was manifested differently in dyadic face-to-face and small group’s CSCL processes. Examples of SSMR are illustrated. Furthermore, cross tabulations and social network analysis of pupils’ participation revealed different findings. Finally, both studies showed that it is empirically possible to identify different functions of SSMR but the dominant function was different in the two contexts.

Fostering and Assessing Self-Regulatory Processes with Technology Rich Learning Environments

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Understanding the real-time deployment of key SRL processes is necessary to develop SRL theories and design adaptive instruction. This symposium brings together a panel of international researchers who are currently developing and applying methodological and analytical techniques to examine the temporal deployment of metacognitive and SRL processes, such as analyzing, planning, monitoring, and evaluating of one’s own cognition, emotions, and motivation. The primary goal of this symposium is to examine metacognitive processes using process data collected during learning in the context of CBLEs. A second goal is to compare different methodological approaches (e.g., log files, thinking aloud data, eye tracking) and analytical techniques (e.g., process mining, sequential analysis, educational data mining) and their contributions towards augmenting contemporary frameworks, models, theories, and methods used in metacognition and SRL. Lastly, we discuss the implications of these techniques in terms of designing optimal CBLEs aimed at fostering SRL.

MetaTutor: An Innovative Technology Environment to Study and Assess Self-Regulatory Processes

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Jason Harley
120 college students were randomly assigned to one of three experimental conditions and used MetaTutor (a multi-agent intelligent tutoring system) to learn about a body system for two hours. During the session, we collected product (e.g., pretest, posttest, quizzes, summaries), process (e.g., concurrent think-alouds, eye-tracking, log-files, physiological data, screen recordings, metacognitive judgments, and notes and drawings), and self-report (on emotions and motivation) data to analyze the roles of cognitive, affective, metacognitive, and motivational (CAMM) processes during learning about the topic with the system. Results indicate that those assigned to the prompt and feedback conditions significantly outperformed those in the other two conditions. Multi-channel data also show how different behavioral signatures may be related to learners’ deployment of CAMM processes during learning. We will illustrate and describe how these data can be mined to understand SRL processes and potentially augment current models and theories of SRL. Lastly, we discuss how to use multi-channel data to design intelligent, multi-agent systems to be more responsive to students’ needs during learning about complex and challenging topics.

Analyzing Temporal Patterns in Students’ Self-Regulated Learning with Process Mining Techniques

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Research in self-regulated learning shows that many learners have difficulties in performing regulatory activities spontaneously. This most probably results in lower learning outcomes. Whereas
most research has concentrated on frequency analysis, so far little is known about the students’ processes of self-regulation. Thus, the aim of our study was to explore the temporal order of spontaneous individual regulation. For this purpose, we contrasted the processes of successful and less successful students and examined whether these groups differed in their SRL-activities during hypermedia learning. We used coded events resulting from think-aloud protocols of the learners as data and a process mining technique (Fuzzy Miner) to generate process models. Our results show that successful students use different metacognitive activities like orientation, evaluation, planning and monitoring. On the other hand, less successful students do not only show less events but they do also have less event types in their process model. Moreover, we found a triple loop with analyzing, monitoring, reading and deep processing by analyzing the coded events of the successful learners. Interestingly, process model of successful learners mirrors Zimmerman’s model of SRL (2000) with the three well known phases of forethought, performance, and self-reflection. In general, our contribution demonstrates that besides occurrence of single learning and regulation events their temporal structure is important to learning performance, which has been often postulated but less often demonstrated empirically.

Using Process Data to Examine Self-Regulation During Clinical Problem Solving with Technology

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This study examines domain-specific regulatory activities in the context of diagnosing diseases. We explore these processes in medical students who are using BioWorld (Lajoie, 2009) a computer-based learning environment designed to support clinical problem solving. A purposive sampling method
was used to identify self-regulated learning (SRL) strategies by examining the antecedents to help-seeking behaviour. We adapted a SRL coding framework from Meijer et al. (2006) and Lajoie and Lu (2012) by classifying both macro and micro levels of self-regulatory activities that pertain specifically to clinical reasoning. The theoretical framework characterizes self-regulated learning as activities occurring in several areas (i.e., cognitive and metacognitive) wherein each skill has a distinct function (i.e., orienting, planning, executing, monitoring, elaborating, and evaluating). Data were obtained from 30 medical students and 5 practicing physicians and collected through log-file entries, video-screen captures, and concurrent think-aloud protocols. Findings demonstrate that the majority of help seeking activities occurred when students ordered a lab-test that was not pertinent to diagnosing the patient. We then investigated the function of self-regulatory activities by inferring adaptive and maladaptive properties based on the diagnostic outcomes and novice-expert comparisons. Adaptive help seeking was associated with improved confidence and diagnostic accuracy. We discuss the implications of these findings in terms of designing a consult tool in BioWorld that provides adaptive assistance based on the specific needs of learners. We also discuss the benefits and challenges of merging data streams in terms of the validity and reliability of inferences made in relation to self-regulatory activities.

Tracking Students Use of Metacognition in an Open-ended Science Learning Environment

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This paper discusses an open-ended computer learning environment (OELE), where middle school students learn science topics (e.g. climate change, thermoregulation) by teaching a virtual agent. The learning and teaching task combines reading and understanding a set of hypertext re-sources with constructing a causal map that accurately models the science phenomena. The open-ended nature of this task requires students to learn, teach, and monitor their learning and teaching, and this presents significant challenges for middle school students. We have developed a combined cognitive and metacognitive model that models desired learning activities and learning strategies like planning, targeted reading, progress monitoring, and help seeking that students need to develop to achieve success in their teaching and learning tasks. To help students navigate their difficult tasks and to help them learn appropriate strategies, a mentor agent provides feed-back and strategy advice that helps students acquire the relevant cognitive and metacognitive strategies in a timely manner. We discuss the results of a study where we used sequence mining techniques to analyze students’ activity sequences and derive their learning behaviors and strate-gies as they taught their agent.

Educational professionals and peers facilitating mono- and bilingual language acquisition

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Children’s language competencies and the educational mandate of early childhood education and care (ECEC) institutions to offer language support in the majority language and the children’s first languages have been a matter of concern since several years. This has been especially triggered by the question of educational inequality referring to children from low socio-economic and migrant backgrounds lacking important language skills (Gogolin et al., 2003; Gomolla & Radtke, 2009; PISA: OECD, 2006). Therefore, the interdisciplinary symposium seeks to integrate different perspectives on the potentials of educational professionals and peers facilitating mono- as well as bilingual language acquisition in ECEC institutions. The papers are based on both qualitative and quantitative approaches to data collection and analysis. Effective strategies of everyday language support are identified and analyzed. Different aspects of the professionalization of educational professionals, such as language observation, educational diagnostics, as well as language support techniques, are also discussed.

Diagnostic competencies of early childhood educators for fostering language acquisition

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Fostering language in early childhood institutions is based on diagnostic processes which include the collection of information about the children’s language and communication competencies. Educators need to have knowledge about language development and the use of diagnostic instruments with the aim to meet the individual child’s needs. 47 early childhood educators from Switzerland and
Germany with different professional backgrounds took part in a study that was designed with pre-tests, a professional development course of 2.5 days, and post-tests. The diagnostic competencies were measured with a questionnaire, an interview method using film vignettes and a stimulated recall after a video based observation. The results show that the attitudes towards diagnostic tools differ significantly between kindergarten educators and play group leaders. This reflects the level of professionalization. Correlations can be found between years of duration of training and the attitudes towards diagnostic tools, with educators with longer training being more positive about the use of diagnostic tools and a higher tendency to observe more linguistic aspects. Post-test data has still to be collected and the interviews and recalls have still to be analysed. Comparing pre- and post-test will provide insight as to what extent the professional development has changed self-evaluation of diagnostic competencies. It will be of another special interest to find out whether correlations can be found between the educators’ attitudes, knowledge and their actual practice. The results will have implication on the design of future in-service trainings.

Everyday language supports practice of educational professionals. Evaluation of the Fellbach-project

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The reasonable wish of children having good language competencies, which are the basis for lifelong learning and living chances- makes well-educated professionals indispensable who are able to implement efficient language support. As language support is an educational mandate of ECEC institutions and primary schools and the staff there is not trained sufficiently in their vocational and academic education in the field of language support (cf. Fried, 2010), they have to upgrade their qualifications. As well, the question which language support concept works best and reaches all children is not answered adequately yet. This paper presents in a first step the idea of an advanced training concept on everyday language support for children in ECEC institutions and primary schools in. Secondly, results of the longitudinal project evaluation with a treatment and a control group are discussed concerning their educational relevance. The educational professionals in the treatment group could enhance their language support competence by using more language supporting techniques at the post-test, which had effects on the children’s language skills as they improved them more over the time course than the children in the control group.

Potentials of bilingual educational professionals as resources in multilingual language observation

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The resource of linguistic and cultural backgrounds of educational professionals is often not sufficiently used within teams in ECEC institutions, as a narrow focus on the majority language can be found in many institutions. Because of that, there is an urgent need to professionalize educational professionals in the area of bilingual language education. This paper presents a qualitative study that focuses on the strategies of educational professionals for effective language observation of bilingual children. Turkish-German and Russian-German educational professionals as well as monolingual German educational professionals participated in communication situations in different language modes. The situations were video recorded in the ECEC institutions. After reflecting on the video scenes, the educational professionals were interviewed on their subjective constructs concerning beneficial interaction and observation of linguistic and communicative competences of bilingual children. Also, they provided information about their personal and professional biographies. Results give revealing perspectives to empathic attitudes of the educational professional to children with bilingual background. These attitudes correspond with the educational professionals’ biography and with beneficial strategies as well as more correct assumptions regarding the language and communication competences of the children. These findings have important implications for the design of training programs to develop professional self-competence and to strengthen linguistic and cultural potentials of educational professionals.

Peers as mediators in second language acquisition- Examples from structured and free play activities

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Internationally, more and more children grow up speaking more than one language. Thus, there is an urgent need for strategies supporting culturally and linguistically diverse preschool children as they develop their second language skills. Besides interactions with educational professionals, peer interactions are an important source of language input in ECEC institutions. Yet, their specific role in second language learning has not been investigated by many researchers. The current mixed methods study analyzed various data (field notes, videotape and audiotape) from 18 4-5 year old Turkish-German preschool children interacting in structured as well as free play activities. Results showed multiple strategies of peer language support, such as translating, explaining, and scaffolding. Peers can create multiple opportunities for language use, act as language models and use support strategies additional, or even new, to those used by adults. Thus, employing peers as mediators in language support may be a viable way to enhance selected language skills and create an encouraging language learning environment in the ECEC setting. It is the educational professional’s challenge to construct environments in which children can use their expertise to co-create learning opportunities through which everyone can contribute and learn.

Self-efficacy in Relation to other Motivationally Relevant Variables

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Student motivation is a central factor of student’s academic achievement. Therefore, educational research regarding student motivation and its determining factors becomes increasingly important. The research presented in this symposium centers around self-efficacy, a core variable for student achievement. The aim is to discuss antecedents and structure of self-efficacy and also its function as a moderator for other motivational variables. Self-efficacy is examined via experiments and questionnaires from several perspectives drawing on student data from grade four to college. The first contribution is a series of experiments on the important role of self-efficacy in the appreciation of task utility value, taking into account situational interest and performance. The second paper also tackles utility values: Together with self-efficacy they predict how threatening students perceive fear appeals to be. The third paper investigates gender-specific differences in the measurement of self-efficacy, its relation to academic self-concept, mastery goal orientation, and interest as well as mean differences for these variables. The final contribution expands self-efficacy theory by introducing autonomy support from teachers as a further predictor of self-efficacy besides the four sources hypothesized by Bandura. This symposium has the great advantage of bringing together empirical results from a variety of perspectives, while at the same time conceptualizing and measuring self-efficacy similarly. The findings of the studies inform policy-makers and practitioners. Also findings are of high scientific relevance, since little is known about the dynamics of student’s motivation and determining influences of contextual factors of self-efficacy.

Perceived Competence Moderates the Effects of Utility Value Information on Interest and Performance

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Utility value interventions that help students discover the importance and personal relevance of academic topics have great potential for promoting interest and performance in education. However, it is important to consider individuals’ perceptions of competence, and recognize that students need to feel competent before they can fully appreciate the utility value of academic topics. Three studies tested the effects of a utility value manipulation on situational interest and performance, and the moderating role of perceived competence in math. College students learned a new technique for
mentally solving multiplication problems. In Study 1 (N = 62), the effect of the utility value manipulation was positive for individuals with high perceived competence, but negative for individuals with low perceived competence. Studies 2 (N = 118) and 3 (N = 148) manipulated whether participants received a confidence boost before receiving the utility manipulation. The results showed further support for the importance of perceived competence in moderating the effect of utility value manipulations. The negative effects of the utility value manipulation were reduced (Study 2) or reversed (Study 3) when participants received encouraging performance feedback. The discussion centers on the importance of positive ability beliefs in appreciating the utility value of tasks.

Perceived Classroom Fear Appeals: Antecedents and Motivational Outcomes

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Prior to high-stakes exams teachers use persuasive messages which highlight the consequences of failure and timing of exams as a motivation strategy. These messages, referred to as fear appeals, share several salient characteristics with autonomy restrictive teacher practices. In this study we examined how (i) academic self-efficacy and utility value are antecedents of the appraisal of fear appeals as threatening and (ii) how fear appeals relate to motivational outcomes. Results showed that fear appeals were appraised as more threatening when personal self-efficacy was low and students shared a perception of lower intrinsic value and higher intrinsic value. Fear appeals showed inverse relations with intrinsic motivation and mixed relations with extrinsic motivations, some positive and others inverse. These findings suggest that although fear appeals may share some similar characteristics with autonomy restrictive teacher practices, the motivational outcomes are quite different. It is of both theoretical and substantive interest that practices which elicit fear in classrooms may not be solely equated with negative outcomes. There is considerable merit to be found in establishing the conditions under which fear appeals may be enhancing intrinsic and extrinsic motivations.

Testing Gender-specific Measurement Invariance and Interrelations of Motivational Variables

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While boys and girls achieve similarly in mathematics and girls are in favor in reading, differences mostly favoring boys can be found in motivationally relevant self-perceptions (Else-Quest, Hyde, & Linn, 2010). These self-perceptions can be conceptualized differentially based on the specificity of the domain/action in question and also concerning the psychological factors involved (e.g., affect, knowledge, goals). While gender-specific mean differences of self-efficacy, self-concept, goals and interest are well-established, it remains an open question whether perceptions of and relations between these variables also differ systematically in secondary school age. The aim of our study is threefold: First, we examine gender-specific measurement invariance of well-established instruments for the above mentioned motivational constructs in the domains of reading and mathematics. Second, we compare gender-specific means of these core motivational constructs. Finally, a model in which the domain-specific motivational variables interest and self-efficacy are predicted by the general motivational orientations mastery goal orientation and academic self-concept is utilized to investigate if path coefficients differ between boys and girls. Latent structural equation modeling was employed to permit simultaneous multiple group modeling (N = 244 7th graders, 145 male, 99 female). Results show partial (strict) measurement invariance. MANOVA results show that means differ as expected favoring mostly boys. Path coefficients show gender-specific patterns as well; especially self-efficacy is predicted differently for boys and girls. Implications for research and practice are discussed. Else-Quest, N.M., Hyde, J.S., & Linn, M.C. (2010). Cross-national patterns of gender differences in mathematics: A meta-analysis. Psychological Bulletin, 136 (1), 103-127.

Exercising Control: Perceptions of Autonomy as Sources of Self-Efficacy in Reading and Mathematics

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The purpose of this study was to investigate U.S. adolescents’ (N = 1,902; Grade 4-8) perceptions of autonomy support from teachers as a possible source of their self-efficacy in mathematics and reading. General self-efficacy, test-taking self-efficacy, and self-efficacy for self-regulation in both reading and mathematics were regressed on Bandura’s hypothesized four sources of self-efficacy and students’ perceptions of autonomy support from their teachers. Autonomy support was found to be a significant predictor of each type of self-efficacy in both reading and mathematics and contributed a significant amount of variance to each of the models. Findings and implications for educators are discussed.
Children vary greatly in their cognitive abilities. To meet their learning needs, it is important to gain more insight into their inter-individual differences. This symposium aims to present recent research about inter-individual differences from different angles. The emphasis is on the possibility to relate these inter-individual differences to adapted instructional designs. Starting from the idea that optimal learning occurs when an instructional design is matched to learners’ prerequisites, it is important to take inter-individual differences into account in order to adapt learning situations adequately. The first paper is a theoretical review focusing on personal and environmental variables in the educational context that support or prevent an optimal development of cognitively excellent kindergarten children. Thereof, conclusions about an adequate learning environment for these children are derived. The second paper concentrates on the beneficial effect of hypermedia learning for high-ability fourth graders and how specific learning prerequisites may support benefiting from hypermedia learning. The third paper investigates whether children with different cognitive abilities differ in their need for support when working on an inquiry task. The fourth paper seizes the instructional design of inquiry learning and focuses thereby on the role of executive functions for successful scientific questioning which represents a core element during inquiry learning. In total, the symposium spans across different theoretical and methodological approaches which consider inter-individual differences in cognitive abilities and how learning situations may be adapted, and thus improved, in this regard.

**Determinants of Excellent Kindergarten Learning of Excellent Pupils**

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Research shows that learning processes of cognitively excellent pupils (CEPs) are generally not supported in kindergarten and primary school, often resulting in cognitive, social, and emotional underachievement as well as other negative effects which manifest themselves later in the children’s educational careers (e.g., dropout, behavioral problems, et cetera). This literature study tries to theoretically reveal the causes of this underachievement and presents solutions which lead to excellent learning of CEPs in kindergarten. Personal and environmental determinants are discussed that facilitate or hinder the CEPs’ cognitive, social, and emotional development. A literature search
identified determinants that formed the basis of a theoretical multilevel model in which excellent kindergarten learning is modelled. Several individual and contextual variables (i.e., home, kindergarten) on pupil, class and school level are integrated. At kindergarten entrance, the abilities of CEPs are already influenced by the home environment. During kindergarten, important determinants from the kindergarten context such as internal class and school differentiation also enter the equation. This differentiation determines whether CEPs are enabled or even empowered to work at and above their own cognitive levels; a requirement for learning. The model is currently being validated in 41 different kindergartens in a 2-year intervention study aimed at improving internal school and class differentiation. Conform the model, the hypothesis is that the intervention, if properly implemented, will result in better cognitive, social and emotional development of CEPs as compared with their development in regular kindergarten/primary school.

**Which Characteristics of High-Ability Fourth-Graders Support Hypermedia Learning: An iPad-Study**

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Nowadays, hypermedia learning is a common learning approach in education. Due to its high degree of learner control it is likely to be particularly beneficial for high-ability students. However, it has not been investigated yet whether learning with hypermedia is really more beneficial for high-ability learners compared to more structured learning environments. Moreover, it is not clear which specific learning prerequisites of high-ability students indeed support successful hypermedia learning. The present study was thus designed to shed light upon these issues. To this end, in the present study we compared the learning achievement of highly- and average-able fourth-graders in two learning environments (hypermedia vs. linear) and assessed the following learning prerequisites: intelligence, working-memory capacity, self-regulation, and self-efficacy. Results showed that particularly for ‘complex-knowledge-tasks’ as well as for ‘scientific-transfer-tasks’ high-ability learners benefited more from hypermedia learning than from learning with the linear environment. Apparently, depending on the kind of task hypermedia learning is more or less beneficial for high-ability learners. This benefit in turn could mainly be ascribed to high-ability learners’ higher working memory capacity and self-efficacy beliefs. Intelligence and self-regulation did not mediate the effect. Future studies should replicate and generalize the current findings about the beneficial effect of hypermedia learning for high-ability students to improve the application of hypermedia learning.

**Utilizing Support in Inquiry Tasks: Identifying Differences between Ability Levels**
This study investigated whether children of different ability levels differ in the extent to which they use support during an inquiry task. Children worked for 20 minutes with a simulation on the Galileo experiment. In one condition hints for performing the inquiry task were available. Children could use these hints when needed. In the other condition this support was not given. Domain knowledge was measured before and following the inquiry tasks, and again three weeks later. Motivation was assessed on three moments as well; before, during, and right after the inquiry tasks. Children’s actions were stored in log files. On all three test moments above average children showed higher domain knowledge than average children who in turn scored higher than below average children. Only above average and average children gained knowledge from pretest to posttest, scores of below average children stayed at the same level. For children of all three ability levels scores remained the same from posttest to retention test. Above average children showed higher motivation on all three measures when working on inquiry tasks compared to the children of average ability. Motivation of below average children did not differ from the others. There were no differences between the supported and the non-supported condition, neither for knowledge gains nor for motivation. Process measures focusing on differences in use of support are currently being analysed.

**Individual Differences in Scientific Questioning: The Predictive Value of Executive Functions and IQ**

Diagnostic testing in education is gaining ground. Intelligence testing often takes place with the intent to advice parents, teachers and students during school years. A growing number of schools embrace early diagnostics in predicting cognitive capabilities in students with the incentive to guide their learning process and instruction. This study investigated whether an Executive Functions (EF) approach may provide a framework with which one can investigate the learning process in more detail than traditional intelligence testing. This implies the future objective to guide tailored instruction during Inquiry Learning. Students (N=143) in grade 2, 4 and 6 were tested on both EF and intelligence. Results were correlated with Scientific Questioning (SQ) performance, which is an essential aspect of the Inquiry Learning process. Preliminary results show that SQ-performance was significantly correlated to the Executive Functions as well as intelligence, with highest correlations found for Inhibition, subsequently followed by intelligence, Figure Fluency, Word Fluency and
Working memory. Analysis shows a pattern revealing strong predictive validity of Executive Function measures in all grades. Most remarkable in this respect is the realization that a test battery, which only takes up to 15 minutes to administer, predicts SQ-performance better than a test that takes up to 1.5 hours to administer (IQ). With the (Dutch) tendency to test students early and often, practical implications are significant in decrease of test time. Combined with more research on other elements of the Inquiry Learning process, results may help guide instruction during Inquiry.

**Facets of teacher competences and teacher perceptions**

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Germany

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Aims of the symposium: Current discourse surrounding teacher competence and its development has established that teacher competence is a primary requirement for high level performance in the classroom. It has also established that this competence covers a variety of types of knowledge that a teacher should ideally possess (Shulman, 1986). Bromme (1992, 1997) has taken up and further developed Shulman’s classification, which, from his perspective, also contains value systems (philosophy of the school subject, convictions, teachers’ perception of learners etc.). In our symposium we focus on four different facets, namely: (1) Diagnostic competence of teachers (errors identification and feedback), (2) Pedagogical content knowledge, (3) Conversational strategies during mentoring conversations and (4) Pre-service teachers’ assessment of research skills in acquisition of teacher expertise. Scientific and educational relevance Various studies show that teacher competence is essential for high level performance in the classroom. But despite many studies the state of research still is unsatisfactory. We need to have more reliable results on how knowledge, beliefs and strategies work and interact and effect performance. The symposium aims to provide more insight in this area by presenting results of four studies that look at teacher competence from different perspectives.

**Diagnostic Competence of Teachers - Error Identification and Feedback in Learning Processes**

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Diagnostic competence is an important facet of teacher competence that has a positive impact on learning processes and performance of students. Precise diagnosis allows teachers to adapt their teaching to students’ individual needs. Studies show that teachers often lack in this field, which might be due to the fact that in most teacher education programs pedagogical diagnostics are neglected. In our research we narrow the focus on diagnostic competence to error identification and feedback in learning processes. Our study aims to analyze these competences testing 287 (prospective) teachers. Results show that only experienced teachers are competent in this area.

Mentoring Conversations and student teacher’s learning

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This study focuses on the mentor’s conversational strategy used during mentoring conversations and its impact on student teacher’s learning for the profession. Using a case-design 12 conversations between a student teacher and his/her mentor were video-analyzed on conversational moves by the mentor and compared on resulting student teacher knowledge productivity (measured as behavioural intentions to change ones practice); as well as student teacher perceived motivation. An instrument was developed to code the conversational moves by the mentor. In the case analysis it was controlled for familiarity between stakeholders and closeness to the domain of conversation. The findings of this study suggest that: The mentor’s approach taken during conversation was found to differ based on the conversational moves, signifying different strategies of conversation. The conversational moves do not significantly influence the student teacher’s perceived knowledge productivity. We noted two dominant moves: a scaffolding and prescriptive one, which we called ‘high road’ approach and an exploring one we called the ‘low road’ approach. Student teachers who have positive relationship with their mentor were associated with higher knowledge productivity. These findings indicate an overall effect of conversational strategies on student teacher’s learning outcomes. However, no direct relation was found between specific mentor moves and perceived knowledge productivity, although higher scores were found for ‘low road’ approach.

Conditions of the Development of Pedagogical Content Knowledge

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Pedagogical content knowledge (PCK), i.e. knowledge necessary to make subject matter accessible to students, is considered to be a key component of teacher competence. Recent studies showed that PCK indeed impacts quality of instruction and student progress. Thus, the question of how teachers develop PCK is an important issue for educational research. The study at hand aimed at investigating conditions of the development of PCK, and especially the role of prior content knowledge (CK) and prior pedagogical knowledge (PK) for the development of PCK in the domain of mathematics. In a longitudinal design, PCK, CK, and PK had been assessed by tests at two points of measurement within a sample of 848 student teachers during their induction phase in Germany. Cross-lagged analyses with latent variables showed that prior CK and PCK significantly impacted PCK development. However, prior PK did not. The results provide evidence for the interplay of prior PCK, CK and PK in the development of PCK. As suggested by qualitative studies, CK seems to be an important prerequisite for PCK construction. The finding that PK did not impact PCK development challenges the hypothesis that CK and PK amalgamate to PCK, and raises further questions on the nature of PK needed for PCK construction. Consequences for the understanding of PCK development as well as for teacher education will be discussed.

Pre-service teachers’ assessment of research skills in acquisition of teacher expertise

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The purpose of this study is to investigate how teacher students evaluate their research skills learning environment and assess the role of research skills in the development of teacher expertise. A hands-on learning environment was used in which students conduct small-scale empirical research at schools. The participants (n= 36) were pre-service teachers. They were given an e-questionnaire in the first and second year of their five years Master of Education study program. The e-questionnaire consisted of a likert-scale and open-ended questions. Results indicate that students assessed the learning environment positively but criticized the workload. Students in their first and second study year do not differ in their assessment of the role of research skills in acquisition of teacher expertise. However, the qualitative analysis indicates that in the first year workshop the research methods practiced, interview and observation, were considered meaningful in developing teacher expertise. In sum, multi-method and longitudinal assessment is needed in order to support individual learning processes and high-quality teacher education.

Designing Effective Multimedia Digital Games To Promote Learning

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Cathy Tran
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Children, adolescents, and many adults spend a significant portion of their time interacting with digital games (Young et al., 2012). Although games have long been considered to be a promising medium for learning (e.g., Gee, 2007), much is left unknown about the specific features of digital games that promote learning. Serious games is an emerging field, with several lines of research contributing to how to best develop educational games (e.g., Covington, 1997; Zyda, 2005; Sanchez & Olivares, 2011). Given the multimedia nature of digital games, research on cognitive theories of multimedia has been applied to the design of digital learning games (Mayer, 2011). Additionally, some researchers have found game mechanics to align well with the development of flexible thinking (Hong et al., 2009). Other researchers have looked at educational games mainly from a motivational perspective. For instance, Habgood and Ainsworth (2011) pointed out that a concern with educational software is its frequent use of the game element as a reward after the completion of learning tasks. These authors recommend intrinsic integration, such that the learning material is delivered through the parts of the game that are most motivating and therefore most fun to play. The aim of this symposium is to present examples of digital multimedia learning games developed to promote learning both in and out of school. By highlighting the iterative development of the games as well as empirical findings, we provide researchers and producers with insights about which design decisions may be appropriate for whom under what conditions.

Down With Food: The Journey of Developing a Digital Game that Addresses Science Misconceptions

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This presentation provides insights about the ability of a digital game in the form of an iPad app to help children develop a more complete understanding of and address misconceptions about science concepts. Specifically, the game addresses children’s misconceptions about what happens to their food after they eat and casual misconceptions more generally. For instance, young children commonly harbor misconceptions about causality, assuming that causality is unidirectional rather than bi-directional or mutual. In the context of digestion, children think food enters your mouth, goes down your throat, enters your stomach, and digestion is complete. In order to address these misconceptions, we integrate theories of motivation in an attempt to explain how game-based learning environments can help learners with the process of conceptual growth as it relates to causal misconceptions more generally. Learners who are motivated to master a task are
more likely to use cognitive strategies to reflect on their thinking and patterns of reasoning; such thinking processes influence conceptual change. By contextualizing this learning into a game, we hope that learners will persist in their learning, instead of giving up at the first sign of difficulty. Using a design-based approach, this presentation will document the process of iteratively designing a digital game that is both fun and promotes learning. We will present results from a qualitative study on the development of learner’s conceptual knowledge of the digestive system and causality and suggest directions for future research on directly applying theories of motivation to digital games.

**NumberNavigation: Digital Strategy Game for Promoting Flexible Arithmetic Problem Solving Expertise**

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The study describes the results of a series of play testing sessions with NumberNavigation Game, a computer-based educational strategy game which aims to promote the development of flexible and adaptive arithmetic problem-solving skills in elementary school students. The game is based on the theoretical assumption that the discovery of number patterns and characteristics and connections between numbers and operations will lead to a flexible representation of the natural number system and an adaptive arithmetic expertise. During the first phase of testing, qualitative data was gathered on three consecutive play testing sessions using video-recorded observations, analyses of game play, and open-ended interview questions. The main focus of the study was to explore the relationship of the educational content and different game features as well as to detect possible usability problems. Results suggest that the basic game design is able to support the desired educational outcomes; players often naturally explore alternative routes and problem solutions. Usability problems were treated and solved, and based on the results of the early pilot sessions, a second, complex game version was created and is now being tested in the context of a larger experimental study.

**Comparing The Effects of Technology Activities on Mathematics Achievement and Motivation**

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The goal of the current project was to explore which motivation constructs, expressed through technology-based activities, are most effective for various types of students under what kinds of instructional contexts. We designed three alternative technology-based activities that tapped different frameworks for motivation and engagement. These activities were then randomly assigned as pre-and post inductions for a short mathematics lesson given to students in grades five through eight. Results indicate that group assignment into one of the technology-based inductions was not predictive of student outcomes. However, other teacher and student variables were predictive of student performance, including teachers’ self-efficacy beliefs, their belief in the value of these inductions for their students’ learning, and their fidelity to these inductions. These findings underscore the importance of teachers’ self-efficacy and value beliefs particularly in the successful implementation of technology-based activities.

Digital Games as Tools for Bridging Formal and Informal Learning: An Example on Learning History

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This study is based on the assumption that digital games may be used both in formal and informal settings to contribute to increasing students’ interest and motivation as they learn traditional school contents (Habgood & Ainsworth, 2011). We present data from a larger research project that studied how individuals from different age groups (secondary school students, college students, and +55 years old adults attending a senior university program, N=151) learned while they played with an iPad game we developed about the history of one of the main historical sites in Madrid: The ‘Plaza de Oriente’ (Oriente Square). Participants walked around as they played and visited the monuments and significant historical places in the square. We explored the role of participants’ prior knowledge (knowledge about the contents taught in the game as well as knowledge and experience using technological devices) and participants’ motivational pattern on learning outcomes. Prior topic and subject-matter knowledge, knowledge and experience using technological devices, topic and subject-matter interest, task interest, perceived difficulty, and self-efficacy expectations were measured before and after gameplay. Pretest and posttest measures were compared to assess learning outcomes. Results show that all groups learned after playing the game (recall and comprehension measures) and increased students’ subject-matter, task, and topic interest after playing. These findings suggest that these games may be useful for promoting both students’ learning and interest. Further discussion of results and instructional implications will be developed for the presentation.

Re-thinking Metalinguistic Learning: the teaching of grammar in compulsory school:

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Xavier Fontich
This symposium intends to bring the EARLI participants the opportunity of exploring metalinguistic knowledge and understanding from four different perspectives in four different educational jurisdictions (Montreal, Exeter, Lisbon, and Barcelona). Specifically, the symposium will explore how grammatical knowledge supports students’ language learning and the role of grammatical knowledge in a language curriculum. Internationally, research has highlighted different conceptual and pedagogical issues regarding how an effective grammar instruction might be implemented in order to improve the communicative repertoire of students. Some of these issues, which are part of an international debate about the teaching of grammar and the role of metalinguistic learning, are as follows: the specific grammar of the different written genres, the difficulties students find in learning grammar concepts, the importance of a dialogic methodology in class, the role of grammar conceptualization regarding written norms, or the need to organize a curriculum coherent with research. Each of our presentations adopts a specific perspective on these issues: (i) grammar & writing composition in the UK, (ii) grammar & spelling norms in Quebec, (iii) grammar & curriculum development in Portugal, and (iv) grammar & exploratory talk in primary education in Spain.

**Effects of metalinguistic dictations on orthographic competence in French**

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French orthography is a deep system which makes written French a well-known challenge, even for adults, especially when ensuring mostly silent agreement rules. With the recent developments concerning implicit learning (Pacton & Perruchet, 2006), and the lack of empirical studies demonstrating the benefits of explicit teaching methods in grammar (Nadeau & Fisher 2009), it is important to question the efficiency of teaching methods that develop explicit knowledge of grammar and their effects on the written orthographic competence of students. In the present study, the efficiency of two explicit teaching methods that require peer collaboration for error correction were experimented: sentence of the day (Cogis and Ros 2003) and 0 error dictation (Nadeau et Fisher 2006). These two metalinguistic activities were experimented on a weekly basis throughout the 2010-2011, and 2011-2012 school years. Twelve grade three to grade six primary school teachers with approximately 250 students annually took part in this action-research project. Data includes two video recordings in the classroom and a pretest /post-test of student’s writing. Analyses of the grammatical discussions recorded show that students from all age groups can learn to manipulate the French structures to solve agreement problems through these activities, using explicitly morphosyntactic characteristics. Analyses of the students’ progress show a positive and significant effect on the ability to achieve grammatical agreements.

**Metalinguistic activity in understanding the usages of the simple present tense in Primary Education**

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This paper shows the role of metalinguistic activity in the exploration of some non-canonical usages of the simple present tense by students of primary education in Catalonia. Specifically, we explore
the retrospective usage of the simple present tense, which is used to express situations located in the past (praesens tabulare). Although the praesens tabulare is used in everyday situations (for example, in textbooks of history), students have not thought about this usage, because their school knowledge just identifies this tense with the moment of the speech. From this point of view, this research examines the obstacles that make it difficult for students to recognize this usage, and the strategies they use to overcome them. The results of the study show that students use semantic and experiential strategies, but not morphological resources. Students don’t use their school knowledge (which is, especially, a formal knowledge) because it isn’t useful to develop metalinguistic activity and to discover that the simple present tense can also describe situations that happened in the past. These results confirm the value of developing metalinguistic activity at school in order to connect grammar rules and usages.

**Conceptualising Metalinguistic Understanding in Writing**

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This paper will act as a framing paper for this symposium and will present a theoretical analysis of research on metalinguistic understanding, illustrating how current research does not yet adequately address metalinguistic development in writing. Existing research on metalinguistic understanding has focused more on language acquisition, oral development, and bilingual learners. Research on metalinguistic understanding in writing has tended to look more closely at young learners developing writing skills in spelling, transcription and orthography. Thus theoretical accounts of metalinguistic understanding are currently insufficient to explain developing metalinguistic mastery of composing text and the relationships between declarative and procedural metalinguistic knowledge in writing. If we are to understand better the nature of metalinguistic understanding in relation to writing in learners in the later phases of compulsory education, it is important to develop theoretical clarity about the key concepts involved in order to frame empirical studies which are both conceptually and methodologically rigorous and educationally relevant.

**Re-thinking Grammar Knowledge in the Curriculum: a Portuguese Perspective**

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This paper is a reflection on the role of grammar in the Portuguese Curriculum. The bases for such reflection are the New Portuguese Programs for Basic Education - NPPBE (2009) and the teaching of grammar -, articulating them with Curricular Goals, of Portuguese, for Basic Education - CGPBE - (2012), a document that works as ‘reference for teaching and learning and for internal and external assessment.’ (p.3) of students and manuals of Portuguese Language, in order to respond to the following objectives: i) the importance of grammar in the curriculum; ii) (re) conceptualization of Grammar in NPPBE, CGPBE and iii) methodologies for teaching grammar. Between the Program of 1991 and the Program of 2009, and respective curricular goals, the main difference occurs at the
level of the contents, having common points in the conception of the grammar and in teaching methodologies

**Argumentation theories and the Learning Sciences – Part 1: Pragma-dialectics**

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In the wake of research on socio-cognitive conflict (Doise, Mugny, Perret-Clermont, Gilly), and ‘critical thinking’ pedagogy, researchers over the past two decades have searched for the constructive and productive processes at work in argumentative interactions between learners (see the collective works: Andriessen & Coirier, 1999; Andriessen, Baker & Suthers, 2003; Muller Mirza & Perret-Clermont, 2009). However, such a research project has suffered from a major obstacle, towards whose remediation this symposium aims to contribute: there has been an insufficient degree of appropriation of theories and models of argumentation in research on learning to argue and arguing to learn, carried out in the Learning Sciences. The autonomous research field of ‘Argumentation Studies’ is represented by the journal Argumentation, and the series of conferences organised by ISSA, the International Society for the Study of Argumentation (see also the important collective work ‘Fundamentals of Argumentation Theory’, 1996, edited by F.H. van Eemeren, R. Grootendorst and F.S. Snoeck Henkemans). It could be argued that monological theories, such as that of Toulmin, have received more attention in education that more dialogical theories, proposed by F.H. van Eemeren, and by D. Walton. This symposium is organised around discussion, by leading educational researchers, of the research of one of the most eminent contemporary argumentation theorists, Prof. Frans van Eemeren (theory of pragma-dialectics). It is followed by the proposed EARLI 2013 symposium ‘Argumentation theories and the Learning Sciences, Part 2: Critical Argumentation’, organised by Prof. Michael Baker (CNRS, Paris).

**Reasonableness in Argumentative Discourse**

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Van Eemeren explains the view of reasonableness that is given shape in the pragma-dialectical theory of argumentation. Argumentation is in this theory put in the context of a critical discussion aimed at resolving a difference of opinion on the merits. Van Eemeren explains the rules for critical discussion that apply to the various discussion stages. In pragma-dialectics, fallacies are defined as argumentative moves that violate a rule for critical discussion. All traditional fallacies can be systematically characterized as fallacies in this sense, which demonstrates the ‘problem-validity’ of the theory. Their intersubjective acceptability, necessary for using them as a tool for resolving differences, is demonstrated in experimental empirical research. Van Eemeren issues three notes of warning when making a fallacy judgment: (1) first the discourse needs to be reconstructed in an analytic overview that provides an adequate starting point for an evaluation; (2) it needs to be checked whether all ‘higher order’ conditions have been fulfilled that are prerequisites for a fair
evaluation; (3) to do justice to the functional and context-dependent differentiation in the implementation of the rules for critical discussion, the communicative activity type in which the argumentative discourse takes place needs to be taken into account.

**Extending pragma-dialectics to educational dialogues: seven pillars of interpretation**

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The focus in collaborative learning research, on analysing argumentative interactions between students, can be seen as motivated by the reflexivity, socio-relational and cognitive intensity, and social ritualisation inherent in these forms of exchanged discourse. This paper argues firstly that pragma-dialectics is the right place to start in theorisation of these phenomena, and secondly that this theory needs to be supplemented by other analytical dimensions in order to understand knowledge co-elaboration in educational social interaction. Thus, seven dimensions of analysis are proposed: dialectical, rhetorical, discursive, epistemological, dialogical, socio-relational and affective. Examples of knowledge elaboration processes in argumentation dialogue are discussed, derived from several corpora, in terms of specific relations between the seven analytical dimensions. In conclusion, prospects for extending and synthesising argumentation theory and learning theory are discussed, in order to more precisely apprehend the interactive elaboration of knowledge in educational situations.

**Scripting argumentative knowledge construction**

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Students are supposed to acquire argumentative competency to participate and shape discourse in their respective fields. Whereas University education in its current main forms of lectures and textbook learning hardly foresees practicing argumentation, computer-supported collaborative learning environments for argumentative knowledge construction have been designed to engage and train learners in argumentation. Here, approaches of scripting argumentative knowledge construction in these environments are being reviewed with respect to their potential for facilitating specific argumentative practices, and with respect to their shortcomings so far of equally facilitating domain-specific knowledge acquisition. It will be discussed to what extent scripts can activate existing or facilitate the internalization of new, productive patterns of argumentation in learners.

**How Questions drive Cognitive Development in Science?**

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This work will explore the role of student questions in promoting and using argumentation in science education. The research will show how exploring students’ questions before and during argumentative activities about a specific phenomenon can act as a stimulus for productive argumentation and develop a deeper conceptual understanding of the essential scientific ideas. Critique is a feature of science and good science education is reliant on the ability to ask questions that challenge and explore. Findings from the work illuminate some of the role that questions can play in the learning of science. This work will also report on the role of diagrammatic representations in structuring the construction of scientific arguments.
Accuracy and Consistency of Human Rated Task Characteristics for Items Testing Reading Comprehension

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Knowledge about task characteristics, which are significant for predicting item difficulties, provides valuable information about processes involved in successful performance and for the construction of new test items (DeBoeck & Wilson, 2004; Embretson, 1998). To gather reliable human ratings of relevant task characteristics for reading comprehension is still challenging, mainly due to the complexity and uncontrolled sources of difficulty in reading comprehension tasks. The major research aims guiding the current study are to analyze consistency and structure of human ratings of task characteristics testing reading comprehension in English as a foreign language. Altogether 43 texts and 262 items, from two German large-scale assessments, were rated with respect to eight task characteristics by five trained raters. Acceptable rater agreement could be achieved for six characteristics. Correlations between the characteristics show distinct patterns across raters. Similarities and differences in the correlation patterns between the raters are further explored. Implications of the results for further research in this field and for item development are discussed.

Evaluating the effectiveness of school systems using national assessment time-series data

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This paper examines the effectiveness of educational systems in Australia in terms of the development reading and numeracy in grades 3 and 5. It uses national assessment data over a five year period from 2008 to 2012 to examine changes in average achievement and the distribution of achievement nationally and in eight educational jurisdictions. It concludes that there have been overall improvements in reading among grade 3 students and numeracy among grade 5 students. These improvements can be related to initiatives in policy and practice over the period. Improved reading among grade 3 students can be related to increased emphasis on pre-school education and the development of reading in the early years of school with the largest change being also associated with structural changes in school commencement. Improved numeracy among grade 5 students can be related to changes in curricula and approaches to teaching.

Electronic portfolio as a tool to develop pre-service student teaching competences: challenges?!

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Yves Blieck
During recent years, teaching practice has gained importance as a significant period of learning for the development of teacher competences. These teacher competences are regarded as the possession and development of sufficient skills, knowledge, appropriate attitudes and experience for the successful performance of one’s professional roles as a teacher (McNamara, 1992). Hence, many teacher education institutions are aiming at the development of teacher competences (also) during teaching practice. A popular instrument to achieve this aim and to assess the development of teacher competences is the electronic portfolio. This research study investigates the use and effects of a competence-based electronic portfolio for the assessment of teacher competences during teaching practice in a Flemish academic teacher education program. Therefore, questionnaires and semi-structured interviews were administered to three parties, student teachers (N=41), teacher trainers (N=25) and mentors (N=46). Results show that the e-portfolio proofs to be a useful instrument for the assessment of teacher competences according to teacher trainers and mentors. Student teachers, in contrast, do not belief that the electronic portfolio achieves this aim. In their views, the portfolio is unable to reflect and demonstrate their teacher competences sufficiently. Why that is the case, is the central focus of this paper. Challenges for quality assurance in assessment become apparent.

Development and Evaluation of a paper and pencil test measuring biology teachers’ PCK and CK

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On the one hand there are not yet enough developed test instruments measuring biology teachers’ professional knowledge. On the other hand an adequate validation for the developed instruments is often missing. The here presented part of the project, ProwiN (acronym for professional knowledge in science teachers), is a first step towards closing this gap for biology education. In ProwiN the pedagogical content knowledge (PCK), the content knowledge (CK) and the pedagogical knowledge of science teachers’ is evaluated by using paper-and-pencil tests as well as videotaping lessons combined with students’ achievement tests. For realizing ProwiN the Universities of Munich, Duisburg-Essen, Aachen and Bochum are working together. In the presentation, the development of the biological PCK- and CK-items based on theory and empirical data will be focused. Additionally, the evaluation and the validation of the two measurement instruments will be reported. Results concerning the test criteria by using Rasch scale measures (N = 158 biology teachers) showed satisfying reliabilities and fit values for both tests. The ICC for two independent raters was satisfactory as well (ICC > .70). Finally, the additional validation study with contrast groups will be described. Contrast groups (diploma biologists/psychologists; N = 31) answered the PCK- and CK-test. Significant differences between the subgroups substantiated that the developed instruments measure teachers’ PCK and CK in a valid way. The new instrument will be used in combination with classroom observations in 2013.
Instructionally Sensitive Assessments: How to Develop Them and What Empirical Evidence Supports Them

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The concern raised some years ago in the United States about the use of standardized tests to measure differential school or program effectiveness (see Airasian & Madaus, 1983; Madaus, Airasian, & Kellaghan, 1980) has been posed again recently. It has been argued that the instructional quality students receive and the effectiveness of educational systems cannot be adequately monitored or evaluated unless instructionally sensitive assessments are used (Popham, 2007; Ruiz-Primo, Shavelson, Hamilton & Klein, 2002; Wiliam, 2007). Indeed, accountability tests are largely instructionally insensitive (Popham, 2007; Wiliam, 2007) mainly because very little of what is taught gets tested due to the sampling procedures used for large-scale tests and, therefore, test results reflect general ability or maturation rather than effective instruction (Wiliam, 2007). This paper presents an approach to develop instructionally sensitive assessments (ISAs) that has been guided by the questions: What are the critical characteristics of the assessment construction and evaluation process that can assure instructional sensitivity? Is the instructionally sensitive assessment development approach robust enough to allow systematic replication across curricula? The approach has been tested with three science modules by eighteen teachers and 427 students at Grade 5. The paper provides information about the approach used, the empirical evidence collected about its effectiveness to develop ISAs, and the lessons learned during the implementation of the approach.

Validity and effectiveness of computer-based versus face-to-face testing in first grade

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Due to the innovative possibilities computer-based assessment offers many advantages over both traditional paper-and-pencil and to the more traditional face-to-face approach. The transition raises several issues regarding validity and comparability of the measurements. The purpose of this paper is (1) to study the media-effect using a speech-sound and hearing test by first grade students (age 6-7); (2) study validity and comparability issues; (3) categorize students based on their media-dependence. Because of the young age of the target population in face-to-face (N=364) condition the 60 item test was administered and scored by trained test administrators. In computer-based environment (N=844) instructions were given online using headsets and automatic scoring was used.
data collection was carried out in school’s computer rooms. The reliability index was higher, the standard error lower in computer-based than in face-to-face mode (Cronbach-a=.92 and .89, SE=.46 and .51, respectively). Students’ achievement was higher, standard deviation was lower in face-to-face (M=91.36%, SD=9.88%) than in computer-based format (M=84.98%, SD=13.65%; t=8.05, p)

Assessing students’ procedural knowledge in the natural sciences

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The project’s main goal is to assess students’ procedural knowledge (knowledge about experimental strategies) at the beginning of secondary school (grade 5). Referring to Bybee (2002) subject specific content knowledge and procedural knowledge are gathered under the term Scientific Literacy. The majority of existing test instruments on students’ procedural knowledge are time-consuming interviews offering only a very restricted item pool. Therefore, a paper-and-pencil test was developed that is applicable to measure students’ achievement in this area. The test instrument should be able to picture the ability spectrum of German 5th grade students, which necessitated the development of an extended item pool. For item construction a two-dimensional competence model consisting of the dimensions of complexity and strategy input was used. It allowed to systematically vary task difficulty. The sample consisted of students from two different types of German secondary schools that are Hauptschule (expected ‘low-performers’) and Gymnasium (expected ‘high-achievers’). Test instruments on students’ reading comprehension and students’ cognitive skills as well as raw score analyses on the test items were used for test validation (Mannel, 2011). As revealed by data analysis the test is a valid instrument for measuring differences in performance between grade 5 students from Hauptschule and Gymnasium on the construct procedural knowledge. Having a closer look on the subgroups’ answering patterns, the subgroups’ specific abilities and difficulties are identifiable to some degree. This knowledge could be used to develop adequate teaching material for the different student groups in future time.

Peer effects and gender differences in task interest when assessing mathematical thinking skills

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This paper reports on a longitudinal study in which development of pupils’ learning-to-learn skills is followed throughout the nine-year comprehensive school in Finland. It concentrates on gender differences and peer effects on task interest from 4th to 6th grade, taking into account children’s previous knowledge in both curriculum-based mathematics and general thinking skills measured by the Finnish Learning-to-learn scale. Task interest has in earlier studies been associated with better task performance. It is also known that peers can have an important role as supporters, or distracters, of learning, but the strongest effects on learning have been usually found in previous knowledge (see Klauer, 1988). The results of this study confirm too that previous knowledge is a strong predictor of later performance, but for boys working skills are also important. The results indicate that mechanisms of task interest are very different for boys and girls. Boys’ interest is strongly related with their success in the task they are currently facing, whilst girls seem to be more interested novel tasks in general despite of their earlier or current performance level. In initial analyses of peer effects, peer groups within a class explained 5 % of the variance in task interest, but more accurate results are to be expected when coding girls into subgroups based on peer nominations is completed.

**Conceptual change of secondary students’ mental models of water springs**

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Prior research has indicated that students on the K12 level show little understanding of hydrological processes. To better understand how learners’ construct their mental models when learning the concept of hillslope springs an analysis of 13-year old students’ learning pathways was conducted. To better understand students’ mental model building and conceptual change processes an explanatory in-depth investigation based on the case study method was employed. An instructional sequence embedded in a pre-post-test design provided quantitative and qualitative data. The instruction used a constructivist learning environment and included worksheets, experiments, physical models, phases of co-construction and one-on-one tutoring interviews. The transcripts of the videotaped co-construction phases and the tutoring interviews, students’ annotated drawings and their answers to the questions in the questionnaire served as the database. The results of the analysis demonstrate that the students achieved significant learning gains through their work with the learning environment. Nevertheless, the students’ prior knowledge played a dominant role in mental model construction and the conceptual change process. Students with no spring-related or science-related pre-knowledge constructed mental models that represent the scientific concept used in the teaching materials. Students with elaborated, experience-based but false pre-knowledge had difficulties to change their mental models.

**Fragile Knowledge and Conflicting Evidence in museums**

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Until recently, museums mainly communicated well-established knowledge. Current science, however, is characterized by a rapid knowledge increase and the growth of fragile knowledge. In order to develop exhibitions that encourage visitors to process information in a differentiated way, museums need to know how visitors deal with conflicting information. Furthermore, museum professionals need information on situational and personal factors that may promote the processing of such information. In the presented study we tested whether processing of conflicting information is influenced by spatial arrangement of the information as well as by situational interest, epistemological beliefs, tolerance of ambiguity, self-efficacy (personal characteristics). In two science museums and one museum of cultural history, text pairs describing conflicting perspectives were displayed. The spatial distance between the two texts was manipulated. Semi-structured interviews and questionnaires captured the personal characteristics of 323 visitors and the way they dealt with conflicting information. The results showed that a majority of the visitors perceived a conflict and a large proportion was willing to process the information on a deeper level. Placing text pairs in close proximity had a positive effect on the processing depth in science museums, but not in the museum of cultural history. A possible explanation lies in the higher density of additional interfering information in science museums compared to the museum of cultural history. Sophisticated epistemological beliefs, a high tolerance of ambiguity as well as high self-efficacy were found to promote situational interest in conflicting information. A high situational interest, in turn, stimulates deeper processing.

The meaning and desirability of sustainable learning and education. A theoretical contribution

It is beyond doubt that we are facing major changes in the way we have been living in Western Europe for the past decades. The crisis of the neo-liberal paradigm that has been reigning public life requires politicians, academics and foremost educators and educationalist to rethink what it is we teach the new generation and how we teach them. It seems to be unlikely that anyone would argue against sustainable learning or the idea that teachers should take responsibility for assisting children in this learning. But this does not mean that there are clear ideas about what this involves or that there is consensus about what these concepts precisely mean and particularly what the consequences are for compulsory formal education. This lecture consists of three parts. First I will provide an analysis of the terms ‘sustainable learning’ and ‘sustainable education’ as well as ‘responsibility’. Then I will clarify the foundations underlying the view that learning needs to be sustainable and that teachers should take responsibility for providing education that makes this possible. The lecture ends with an overview of pro’s and con’s with regard to the desirability of making sustainable learning the objective of compulsory education in primary and secondary schools and the possibility of defending it by means of public reasons that can be agreed upon by reasonable citizens.

Sustainable learning of teachers and school leaders in secondary education

Marleen Rikkerink
This proposal (paper) presents findings from a seven-year qualitative study of educational changes in a school for secondary education. The purposes of this qualitative case study were to: (1) examine which organizational levels contextual factors influence each other and (2) develop a conceptual model that deepens the insight into complex and integral educational innovation. The study is structured along teachers and school leaders learning patterns of ‘innovating while learning’ and ‘the process of sense making’. The result is a conceptual model that consists of a mix of elements of theories about context leadership, organizational learning and distributed leadership. An important outcome of this study is an increased understanding of collective sense making as a strong condition for the institutionalization of a complex educational innovation.

How experts (mis)interpret box plots

Recent studies have shown that students often misinterpret the area of the box in box plots as representing the frequency or proportion of observations in that interval, while it actually represents density. This misinterpretations has shown to be based on the saliency of this area and can be explained by heuristic reasoning as defined by dual process theories. In this study we tested whether expert users of box plots also display this misinterpretation or signs of the same heuristic reasoning as students show. Using a computerized test, we found signs of heuristic reasoning in these experts, both with respect to accuracy and reaction times. If even experts have difficulty interpreting box plots, one can question whether box plots are an appropriate representation to use when reporting data and an appropriate representation to include in the statistics curriculum.
Mathematics Learning with Multiple Solution Methods – Effects of Learners’ Activity

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It is commonly suggested to mathematics teachers to present learners different methods in order to solve one problem. In this context, an experiment was conducted to further enhance this so-called ‘learning with multiple solution methods’. Using a 2x3-factorial design, the effectiveness of multiple versus uniform solutions and the effectiveness of measures to foster an active processing (namely, incomplete examples and example-problem pairs) was examined. A clear ‘multiple solutions effect’ was found. Complete examples and example-problem pairs outperformed.

Working memory and mathematics performance in primary school children: A meta-analysis

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Mathematics performance has received growing interest in the past decade. A factor thought to play a central role in mathematics development is working memory and executive functioning: inhibition, shifting and updating. However, results reported with regard to the associations between mathematics and working memory are inconsistent. The aims of this study are twofold: (1) to investigate the strength of the relation between mathematics performance and different working memory and executive functioning components in primary school children using a meta-analysis, and (2) to explain variation in the effect sizes from categories of mathematics tests, characteristics of working memory tests, sample age, sample type, effect size characteristics and study characteristics. Results indicate that all examined components of working memory are significantly associated with mathematics performance, especially verbal and visuospatial working memory tasks but also inhibition and shifting. Variation in association was moderated by various predictors. Type of mathematics measure was the most consistent moderator: measures aiming at isolated mathematics skills yielded lower effect sizes than general or composite measures. Characteristics and categories of the working memory and executive function measures also moderated correlations between mathematics and working memory (for example: visuospatial updating tasks correlated higher with mathematics if visual information was included than if spatial information was included). Possibly some measures of working memory bear more relevance for mathematics performance than others. Interpretation of the contribution of moderator variables to various models are discussed. Future research should focus on the more precise nature of these associations.
Working memory and mathematical word problem solving: Binding information is the key to comprehension

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Mathematical word problems are considered examples of mathematics outside the classroom. Like many complex cognitive activities, mathematical word problem solving requires simultaneous storing and manipulating information. Therefore interindividual differences in mathematical word problem solving could be related to interindividual differences in working memory. According to Baddeley (2000), the working memory model comprises four components: a central executive, phonological loop, visuo-spatial sketchpad, and episodic buffer. This study was the first to investigate all four components and their role in mathematical word problem solving, computational, and reading comprehension skills. This correlational study included 185 pupils attending fourth grade of primary school, who solved mathematical word problems, as well as computational and reading comprehension, phonological and visuo-spatial short-term memory tasks, phonological and visuo-spatial working memory tasks, a sentence recall task, and a task that required binding visual and phonological information. Analysis showed that the episodic buffer, measured with the binding task, is crucial for reading comprehension. Further analyses showed that reading comprehension mediates the relationship of binding information and phonological loop with computational skill. The results also demonstrated that phonological loop and binding information are related to mathematical word problem solving skill even after controlling for reading comprehension and computational skills. Taken together, these findings suggest that teaching of mathematical word problem solving should focus on binding different kinds of information that can foster understanding of the situation and relations described in the problem.

Cultural Transitions in School Mathematical Learning: A Dialogical Self Perspective

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Using dialogical self ‘I-positions’ as a conceptual and methodological tool, in this paper we examine the ruptures an immigrant student experienced in the transition across school mathematical practices from one country to another. We use a case study approach to explore changes in mathematics identity positions, when an established identity position - the ‘I as a good mathematics student’ - is under threat. We first examine the student descriptions of ‘I-positions’ that reflected a rupture to the self. Then we examine the ‘I-positions’ involved in coming to grips with a new and unfamiliar sense of self (e.g. being no longer good at mathematics) that tries to provide the self with explanations for the change. This involves three specific dialogical self strategies: withdrawing of self,
suspending of the self, and a ‘letting go’ of the old mathematical self. This process also meant the student had to engage with a distinct change to his imagined future, as the imagined ‘I-position’ as studying a scientific subject at University became uncertain. We conclude that the transition process involved dialogical self work to restore some continuity in the self. Of crucial importance for school practice, the reflections of the student show that in immigrant transitions ‘time’ impacts on the dialogical self work. As he stresses that in the early stages of the transition the key others are unknown to the self, and that significant others (parents and teachers) can play a role on the impact of time by becoming aware of its impact.

Relationships between worry, working memory, and algebraic problem solving

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It is often claimed that math anxiety/worry (MA) negatively affects math problem solving ability by reducing working memory (WM) capacity. Researchers who have investigated this claim have examined the relationships between generic MA/worry and WM measures and arithmetic problem solving abilities, which has yielded modest relations among measures. Currently, it is unclear whether (1) the relationship between MA/worry, WM and arithmetic problem solving generalises to other math domains (e.g., algebra), (2) more sensitive measures of MA/worry and WM would result in clearer research outcomes, or (3) MA/worry affects WM or vice-versa over time. To examine these possibilities, 137 14-year-olds completed (1) algebraic working memory, (2) spatial working memory, and (3) algebraic worry tasks over two testing sessions, and (4) an algebraic problem solving task. We used latent change model analysis to examine the mutual influence between WM and worry over time, as well as their conjoint affect on algebraic problem solving performance. The findings indicate that algebraic WM decreased when worry was high, and worry increased when WM was low or decreased. Algebraic problem solving was independently influenced by algebraic WM ($\sigma=-.789, p=.005$), but was not related to spatial working memory ($r=.188, p>.05$). These findings show (1) a MA, WM and algebraic problem solving relationship, (2) an advantage of using domain sensitive over general indices, and (3) suggest that worry takes up WM capacity, and that WM helps to regulate worry.

Effects of group inquiries in advanced mathematics on students’ performance and attitudes

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A number of instructional frameworks for improving students’ skills and attitude have been developed. The main characteristics of an effective inquiry based frameworks are: (1) presenting problems with complex situation, (2) making the situation more grounded in reality, and (3) letting students collaborate. Our research question was whether or not inquiry activities were effective in learning advanced mathematics, which is different from elementary and secondary school mathematics, because it is often difficult to develop problems that are grounded in everyday life. In
the present study, we investigated how students tackled complex problems and what they learned from inquiry activities. Participants were 10th grade students (N = 20) attending a competitive public high school. They were required to collaborate with their peers to find, present and prove a solution to mathematical problems, by discussing in class and communicating their ideas using a specialized BBS system. They responded to a math belief questionnaire and solved proof problems before and after the inquiry activity. From the analysis of the questionnaire, we revealed the changes in the participants’ belief about mathematics, and their cognition of their competencies. Also, the answers to the prove problems before the inquiry activity suggested that the students did not fully understand the meanings of using letters as generalized numbers or variables. We investigated how the inquiry activity affected the participants’ skills and attitude. The possibility of linking secondary and university mathematics through inquiry activities is discussed.

Enhancing scientific inquiry by gradually increased self-regulation

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To improve competences in scientific literacy we developed a science course with emphasis on self-regulation in experimentation for the 11th grade and evaluated it in the terms 2010/11 and 2011/12. The didactical approach of the course focused on stepwise increase of the degree in self-regulation during the experimental work, adequate dealing with mistakes and a high quality of instruction by consistent contents in the given curriculum and commonly worked-out teaching aids. Our research question was: Does the didactical approach lead to positive conditions of teaching and does it enhance the quality of motivation and scientific inquiry? Does the didactical approach enhance scientific inquiry learning and the quality of motivation? Test instruments: 1. a Questionnaire to conduct the quality of learning motivation, 2. a multiple choice test to evaluate the understanding of scientific inquiry and 3. scales of perceived conditions of teaching. Effects of the course on conditions of learning, scientific inquiry and motivation were analyzed with ANOVA with repeated measures. First results for the term 2010/11 showed that the students perceived the teaching conditions much better than in their previous school. In addition the formative evaluation of the course brought initial evidence that the course in scientific literacy had positive effects on output variables like scientific inquiry and learning motivation. We assume, that the positive supporting teaching-learning-conditions lead to higher motivation and the increase in scientific inquiry.

Technological literacy and reflection in the classroom

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In this article we take a theoretical model that describes technological literacy as being enacted by individuals in the course of shaping their lives and the world around them and explore how it is possible to develop meaningful and effective educational classroom activities that intertwine capabilities with technological processes in authentic situations. Technological literacy involves the enactment and shaping of the technological process in such a way that enactment successively recognises the original need as well as a shared purpose and potential consequences, an action that we argue to be reflective, or mindful, in nature. We suggest that two elements of knowledge can be identified as goals for technology education. Firstly, a basic understanding of technological processes, a capability to orient in the landscape of relevant knowledge, and the knowledge contexts of what the process is about. Secondly, reflection on process development, (shared) purpose, underlying needs, necessary competence, consequences, and personal engagement intertwined with enactment. Here the notion of reflection-in-action as the manifestation of a mindful relationship between experience and enactment can be seen as driving the technological process. We argue that the ultimate and proximate purposes of teaching are useful constructs for discussing the constitution of continuity between objectives in classroom activities. An analysis of data from a Swedish technology education classroom is used to illustrate the argument developed. The article concludes by suggesting that focus must be centred on what activities are meaningful, and as far as possible authentic, for pupils as aims for learning.

Development of conceptual competence in science in primary school

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The project Science-P aims at modeling the development of competence on the two dimensions knowledge about science and knowledge of science in primary school. With awareness of research on students’ conceptions and Conceptual Change a model of three hierarchical levels of competence, naïve, intermediate and scientific - was proposed as a way to describe the changes in knowledge. The present paper reports results from a cross-sectional study with 1820 German students from second, third and fourth grade of primary school for the dimension knowledge of science. Analyses for the two exemplary content areas floating/sinking and evaporation/condensation show a significant increase of knowledge across grades with students in higher grades showing particularly better performance on items on density, displacement and evaporation. In the content area floating/sinking girls were significantly outperformed by boys. Furthermore, the assumed levels influenced performance of certain subpopulations: higher grade students revealed a preference for scientific conceptions for floating/sinking while girls generally preferred intermediate conceptions. Although the levels of items exerted a significant impact on students’ performance an alternative description of competence development factoring in the decreasing fragmentation of knowledge will be discussed.
Structure of competence in biology and relation to cognitive ability and language competencies

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With the growing popularity of competence testing in international and national large-scale assessment, fundamental issues of validity concern the internal structure and the relations to relevant covariates. First, we give an overview of the theoretical framework of scientific literacy in general and the assessment of science achievement in Germany in particular. We discuss the nature of two didactically motivated dimensions named ‘factual knowledge’ and ‘scientific inquiry’. Second, we test empirically their distinctiveness with competitive item response models. Third, we investigate the relations between the two dimensions to language competencies and general cognitive ability. The analyses are based on data from 3,165 10th grade students in the academic track, intermediate track or mixed-track school forms in eight German federal states. The results indicate that competence in biology consists of two highly correlated dimensions ‘factual knowledge’ and ‘scientific inquiry’ which can also be understood as concept and process knowledge. The results also indicate a high relation with the more general language competencies and general cognitive ability. Differential effects can be established for the dimensions concept knowledge only: Concept knowledge was more strongly related to language competencies than to general cognitive ability, whereas process knowledge was equally affected by both predictors. Limitations and implications of the results especially with regard to the two-dimensional structure of competence in biology are critically discussed and related to teaching, learning and desiderata for future research.

Development of Critical Thinking and Reasoning Skills through Argument Mapping

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To investigate whether argument mapping, with the use of Rationale software, encourages, develops and strengthens critical thinking and reasoning skills, an experimental research was designed and implemented in Cyprus’ primary schools. The first experimental group worked in groups of three, with one computer for each group, on reasoning activities using Rationale software. The second experimental group worked on the same reasoning activities and in the same way but with pencil and paper, without the use of the software. Students in the control group worked on reasoning activities from their Greek language books, without any specific intervention in their learning process. The pre-test results reveal that most of the students participated in the research did not acquire basic critical thinking and reasoning skills whereas the results of the post-test show that this number was decreased, mainly, due to the performance of the students of the first experimental group, which used the software.

The Repertory Grid as a Tool for Evaluating Place-Based Approach Impact on Students

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The year 2010 was pronounced Year of Biodiversity by the UN, in response to importance of drawing humanity’s attention to the ongoing biodiversity crisis. There is accumulating evidence that in-depth understanding of environmental issues related to complex systems is essential for the development of environmental literacy. This study assessed the impact of a place-based environmental learning unit on development of junior high school students’ systems thinking skills and understanding of biodiversity. The study implemented a qualitative approach using the Repertory Grid Technique. It was conducted in a paired pre-test, post-test design with 20 students that voluntarily participated in an extracurricular science program that included three labs, three field trips for inquiry within the ecological system at the local Shezaf Nature Reserve in the Arava Valley, followed by knowledge integration activities. Comparison of the repertory grids for each participant, prior to and after participation in the learning unit, indicates that the students developed a more complex view of the local ecological system: most of them moved to a higher level within the system thinking hierarchy. Findings of this study support that in relation to system thinking, repertory grid is an effective tool for assessing the subject’s conceptual models, identifying those aspects of a system that are most commonly misunderstood, and providing insight about their capacity to identify the system’s dynamic relationships and to make generalizations.

Clock reading in children with mathematical disabilities. Need for computer assistant software?

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A large number of children with mathematical learning disabilities struggle with the acquisition of the knowledge of clock reading. However there is limited research on this topic. In this paper the result of two studies on this topic will be presented. In the first study 352 elementary school children with (100) and without (252) mathematical learning disabilities in grade 3 (n = 144), grade 4 (n = 146), grade 5 (n = 29) and grade 6 (n = 33) were given the same clock reading test to solve. Within the MLD group the results of children with semantic memory MLD, procedural MLD and age matched control children were compared. In a second study it is examined whether a computerized training can
enhance children’s clock reading knowledge. A pretest-intervention-posttest design with a control group was used. Finally we describe the development of a software package that aims to help teachers and therapists in efficiently addressing clock reading problems in children using their regular curriculum programs. The scientific and educational relevance will be discussed.

**Text only or text integrated with pictures – in what way does multimodal material affect learning?**

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The aim of this study is to describe in what way text-based versus text-picture information affect learning. In total 19 dyslexics and 31 non-dyslexics (controls) viewed learning materials either text-only or text-picture condition. The results showed significant differences between respondents with high versus low phonological ability (PA), both in terms of comprehension scores and visual behavior. A good learning strategy used by respondents with high PA was to quickly get a global overview of the offered information. The results support the theoretical assumption that focal awareness of different parts and its wholeness at the same time promotes learning. The results also show that picture illustrating text decreases learning, and that this effect is driven by respondents with low PA.

**Student self-concept and self-expectations as predictors of class climate beliefs**

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The current study explored the predictive value of self-beliefs for student views of the classroom climate. Student beliefs have previously been shown to influence student academic outcomes and hence the exploration of the interrelationship of beliefs is important. The participants were 1925 elementary school students from a range of socioeconomic areas, aged 7-12 years and half were male. Measures included student reading, mathematics and academic self-concept; and student self-expectations and perceptions of teachers’ expectations as predictors of student perceptions of the class climate. A structural equation model showed acceptable fit with both the self-concept and expectation variables strongly predicting student views of the class climate. The findings suggest that in order for student views of the class climate to be positive, students must also have positive self-views. The findings provide a fruitful area for future research.

**Primary school teachers and learning: An analysis of their conceptions and profiles**

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Marcel CRAHAY
This research sought to identify the conceptions held by French primary school teachers on learning and to understand how these teachers position themselves with regard to different conceptions. In order to analyse the teachers’ beliefs or conceptions regarding learning, we decided to confront two samples of teachers (student teachers and certified teachers) with a variety of propositions formulated in agreement with the main scientific theories of learning. We conducted three separate studies. The first study explored the structure of the conceptions of learning among 119 trainee primary school teachers. We identified six conceptions which reflect different theories of learning. The second study tested the structure of the six factors identified with a sample of 210 primary school teachers. On this sample, we apply a cluster analysis (third study) that distinguishes two groups of teachers: some of them combine the different conceptions of learning whereas others disagree with most of the conceptions initially identified.

**Blended Learning Environment for leadership training: Promoting interest and epistemic change**

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The aim was to apply Engaging Learning Environment (ELE) model for training insurance managers in supporting their employees’ job engagement and well-being. A blended ELE was used as an intervention. The effects of ELE intervention on the managers were examined by utilizing Kirkpatrick and Kirkpatrick’s model (2006), stressing the importance of looking at various levels of the outcomes of the intervention. In the present study, we focused on interest, mindset and epistemological change. A questionnaire was administered before and after the training to look at the changes in terms of these. We measured participants’ reactions, knowledge, task value, and epistemic change. Managers participating in intervention (ELE group, n=23) were chosen to be trained by a major insurance company in Finland, who was introducing a new strategy. The two comparison groups were managers who were randomised in those who had access to the e-learning part only (ELE-E group, n=43) and in those who did not participate in any training (control group, n=42). The statistical differences of the pre- and post-test scores were examined with a repeated-measures MANOVA. Among ELE group, reactions towards training were very positive. In terms of knowledge, the participants knew most of the strategy already before training. In ELE group, the values of the intervention group between pre- and post- test changed significantly in terms of increased interest. Epistemic change also took place: ELE group increased in growth mindset, practical values, and valuing collaboration. To conclude, ELE training appeared to reach some of its main goals.

**Finnish teachers’ mindsets and purpose orientations in teaching and learning**

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This study investigates Finnish teachers’ mindsets and purpose orientations in teaching and learning. According to Carol Dweck (2006), mindsets refer to the set of beliefs concerning whether skills, abilities, intelligence and personality can be developed (growth mindset), or cannot be (fixed mindset). Damon’s theory of purpose defines a purpose as a stable long-term goal to contribute to the world beyond the self that is also meaningful to the self (Damon, Menon & Bronk, 2003; Damon, 2008). Finnish teachers’ (N=464) mindsets and purpose orientations were investigated first with quantitative approach. Second, based on quantitative analysis teachers (N=5) with different mindsets and purpose orientations were chosen for more profound qualitative case studies. The results showed that the teachers’ growth mindset was associated with high purpose orientation and fixed mindset with low purpose orientation. The narratively constructed interviews revealed the stories behind different mindsets and purpose orientations and their associations with the ethical dimension of teaching. The study discusses the need for information and training of mindset and a sense of purpose so that teachers could recognize and develop their abilities and support their pupils to reach their potentiality better.

Relationship of Goal Structures, Social Climate and Teacher Practices in the Hungarian Context

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One of central questions in goal theory research is how teachers promote mastery and downplay performance goal structure. The aim of the present research is to reveal the connection of goal structures, specific teacher practices and that of the social climate of the classrooms through the perceptions of young adolescents. In addition, the differences among grades and classes are also analyzed in order to investigate the generalizability of the findings. 861 pupils of 10-14 years of age (from grade 5 to 8, respectively) participated in the research. Data was collected with the help of student questionnaires containing closed questions only. 11 scales were created to reflect different aspects of the classroom; Math was chosen as the focus of study. Some scales relate to goal theory, others to the classroom climate perspective. In this research, mastery goal structure is associated with task, rule-oriented behavior of the teacher, teacher support, promoting mutual respect among students, evaluation emphasizing ones own personal responsibility; whereas, performance goal structure is associated with task, rule-oriented behavior of the teacher, promoting competition, grouping. Findings suggest that the perceptions of the mastery goal structure are influenced by the circumstances more than the perceptions of the performance goal structure. The results contribute to unpacking what goal structures mean to young adolescents in terms of teacher practices and the social climate. It has practical implications and could guide further investigations in the field.

Developmental Trajectories of Motivation: differences and consequences on mathematic achievement

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This study investigates changes in student’s motivation in mathematics and their consequences in terms of achievement over a period of 4 years. Measures were taken nine times from age 11 until age 14 from a sample of French students (N=1080). Multilevel growth modeling showed different developmental trajectories characterized by substantial intra individual and between student
variability. Having proposed a general model for developmental changes we used a group-based method to identify distinct clusters of individuals following similar patterns of two opposite kind of motivations (i.e. autonomous versus controlled). We then analyzed the associations between each cluster of trajectory and mathematics achievement. We expect to observe less adjustment for students experiencing a decline in autonomous motivation and an increase in controlled motivation than for students demonstrating stable pattern or increase in autonomous motivation. Theoretical implications of the findings with regard to academic motivation will be discussed.

Adult students’ spontaneously described course goals as a function of their goal orientation profile

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The purpose of this study was to examine whether adult students’ spontaneously reported achievement goals vary as a function of their motivational profiles based on personal achievement goal orientations. The sample consisted of 88 students from the Finnish National Defence University (NDU). The data were collected during one course that comprised of two distinct pedagogical phases and forms of assessment. The students’ achievement goal orientations (survey), and their course-specific achievement goal preferences (open-ended format) were assessed twice. Four groups of students were identified based on their achievement goal orientation profiles. Students with different goal orientation profiles differed in their open responses indicating preferences for mastery-intrinsic goals, performance-avoidance goals and work-avoidance goals. Students oriented towards avoidance of effort or display of incompetence mentioned mastery-intrinsic goal less frequently, and performance-avoidance and work-avoidance goals more frequently. The relation between general and course specific achievement goal preferences is discussed.

The influence of individual interest on situational interest and self-efficacy

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Students’ individual interest has been found to contribute to the triggering of situational interest while studies addressing its effects on task-specific self-efficacy are scarce. Further, few studies have investigated the influence of individual interest on the change in situational interest or students’ self-efficacy appraisals across the task. The purpose of this study was to examine whether fifth- and sixth-grade students’ (N=270) situational interest and self-efficacy differed as a function of their individual interest while engaging with an interactive problem-solving task. The repeated-measures analysis of variance showed students’ situational interest to be higher in the ‘high’ than in the ‘low’ individual interest group throughout the task. Students’ in the ‘high’ individual interest group also felt more efficacious at the beginning and middle of the task. The discussion focuses on the role of individual interest as a motivational resource for students’ task engagement.

Sustainability of a case-based approach to learning and teaching generic attributes in universities
Barrie’s research (2004) adopted a phenomenographic approach to identify academics’ understanding of generic attributes. A hierarchy of four empirically derived and increasingly complex categories, namely, precursory, complementary, translation and enabling, emerged. The latter two, which focus on the intersection of the fields of ‘generic competencies’, ‘discipline knowledge’ and ‘professional practice’, have an important place in this research. This research extends Barrie’s work by identifying the critical factors for developing an innovative, case-based approach to introduce graduate generic attributes into the academic and non-academic curricula in the university context. 57 university teachers from 14 departments of the University were involved in three rounds of interviews. This paper reports the findings of the third round of interviews to identify critical factors that can sustain an innovative, case-based approach to introduce graduate generic attributes into the academic and non-academic curricula in the university context. A number of features of sustainability, which include (1) valued and supported as part of the institution’s culture; (2) flexibility in being able to respond to changing job market; (3) ‘mutually adapted’ to meet needs of a given community; (4) maintenance or scaling up by building champions; (5) sense of purpose (for all stakeholders, ie students and teachers); (6) provision of feedback or tangible evidence of success; (7) adequate, appropriate resources that can have multiple or future use; and (8) the reward system, were identified and discussed.

Complexity – the other side of the expertise coin

Element interactivity is recognised as the key determinant of intrinsic cognitive load that defines the difficulty of a learning task. A possible way to lessen the difficulty of learning material with a high intrinsic cognitive load is to change the task complexity through a temporary separation of the overall task into a number of isolated, less complex components (called an isolated-interactive elements effect in cognitive load theory). This technique was investigated in the reported study with 104 first year undergraduate accounting students being randomly assigned to one of two experimental groups, an interacting elements group where participants were required to deal with complex accounting problems in their entirety and an isolated elements group where the complex task was broken down into several constituent components. Previous research has established that learner prior knowledge is a moderating factor in the effectiveness of this method (called the expertise reversal effect). While novice learners benefited from the breaking down of the complex, high element interactivity task, more expert learners had their learning hindered by the simplification process. This study’s results indicated that the expertise reversal effect held for high element interactivity information only. As predicted by cognitive load theory, the interaction effect disappeared with low element interactivity learning material.
Animated Pedagogical Agents: Do they enhance student motivation and learning in an inquiry learning

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The central question in this study is whether the inclusion of an Animated Pedagogical Agent (APA) improves motivation and learning in an inquiry environment on a science topic. The APA focused on two key tenets from expectancy-value theory, namely task relevance and self-efficacy. Because science learning was involved, special attention was paid to the role of gender. An experiment with 61 third-year secondary school students (mean age 14.7) compared three conditions: APA (female image and voice), Voice (no image) and Control (no image and no voice). Significant effects of gender were found. Girls increased more in self-efficacy in all conditions. Girls also gave higher ratings for agent credibility. A significant interaction for self-efficacy during training indicated that the presence of the agent (Agent or Voice) raised these appraisals for girls and the absence (Control) lowered them, whereas for boys the exact opposite result was found. The overall results speak very favorably for the effectiveness of the inquiry learning environment on student motivation and learning.

Negative knowledge and its impact on learning fractions from erroneous vicarious solutions

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There is empirical evidence that reflections of errors can enhance knowledge and skills in different domains. Since findings were mainly derived from controlled experiments with adult students it is unclear whether they are transferable to school settings. Further, it is unclear why errors are beneficial for learning. One explanatory model relies on the assumption that students build up negative knowledge when they reflect on errors. Against this background, we conducted an intervention study in order to investigate the question whether 6th-grade school students can learn fractions by reflecting on errors and if their improvement can be explained by an enhancement of their negative knowledge. N=200 students were assigned either to a learning environment where erroneous vicarious solutions were reflected or to a learning environment where correct vicarious solutions were reflected. Tests to measure both knowledge of fractions and negative knowledge were used before and after the intervention. Our findings indicate that students can develop and use a specific negative knowledge via error reflections. We did not find a significant effect of the learning environment on their knowledge of fractions but there was a significant interaction effect: Error reflections were beneficial for advanced school students. Students with low prior knowledge improved more when they reflected on correct vicarious solutions. Even though negative knowledge shows a mediation effect for knowledge acquisition, we could not confirm that negative knowledge
mediates the effect of the learning environments on knowledge of fractions. The implications of these results with respect to school instructions are discussed.

Testing after Worked Example Study Does Not Seem to Improve Delayed Test Performance

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The ‘testing effect’ refers to the finding that after an initial study opportunity, testing is more effective for long-term retention than restudying. It has been found with a variety of materials, but a recent study suggested the effect might not apply to the acquisition of problem-solving skills from worked examples. The present experiment investigates whether this is only the case when testing consists of isomorphic problem solving or also when testing consists of recalling the example. We used a 3 x 2 factorial design (N = 120) with between-subjects factors Instruction Condition (studying four examples: EEEE; studying an example and then solving an isomorphic problem twice: EPEP; or studying an example and recalling that example in writing twice: ERER) and Final Test Moment (Immediate: 5 min.; Delayed: one week). There was a significant main effect of Final Test Moment, with students in the Delayed conditions performing significantly lower on the final test than students in the Immediate condition. There was no main effect of Condition, however, and no interaction. In other words, no testing effect occurred with either isomorphic problem-solving or recall.

Unique Science Learning Environment and the Impact on Students in Inclusive Middle-School Classrooms

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Students with Learning Disabilities (LD) have difficulties with various aspects of learning and especially in science studies. Despite all these, science is considered to be a discipline with unique advantages for students with LD. This paper describes a didactic multi-dimensional science learning environment - The World of Science and Technology (WOST) aimed at providing an answer to the
diversity in the inclusive middle-school science classroom in general, and students with LD in particular. Research sample included 657 7th grade students who experienced the WOST environment. On the second year the sample comprised of 411 students: 241 learned with the WOST environment for two years-7th to 8th grades. 170 students did not learn with the WOST environment. 56 students (and their parents) agreed to divulge the fact that they were diagnosed as having LD. The study employed quantitative approach. Students expressed positive attitudes regarding the WOST materials and means of support by the end of first year. These responses were significantly even more positive after the second year. Moreover, after two years, the WOST group achieved significantly higher then the comparison group in knowledge test. Students with LD in the WOST group improved their grades to a degree similar to non-LD students and significantly higher then students with LD in the comparison group. Thus, the multifaceted WOST environment show great potential in improving the sense of self efficacy, motivation for learning science, and achievements of students in middle school science inclusive classes.

International students’ approaches to learning, learning experiences, and stress

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Exploring engaging teaching-learning environments for university students is of increasing importance due to its strong association with successful learning outcomes. It is important to elaborate how the teaching-learning environment leads students to engage in, for example, deeper and more successful learning. Our first task is to explore the association between various factors in the teaching-learning environment, students’ study approaches, self-evaluative achievement, and stress by factor analysis and structural equation modelling. Then, we also studied if the association differs between two large student groups: Asian and European students. In total, 307 Bachelor- and Master-level international students including 161 European and 93 Asian students responded to a survey. The survey included the modified version of the Experience of Teaching and Learning Questionnaire (Entwistle, McCune, & Hounsell, 2003) and a stress scale (Elo, Leppänen, & Jahkola, 2003). A factor analysis result implied that international students might be sensitive to course assignments. A path analysis revealed that deep approach and organised studying were associated with study success. Course organisation and alignment dimension was negatively related to deep approach and organised studying. The importance of purposeful course assignment and students’ interest was underscored to enhance deep and organised learning. Organised studying was most strongly connected with students’ self-evaluative study success. Between Asian and European students, the association model structures and regression weights appeared the same, but Asian students’ mean scores of teaching for understanding, organised studying, and surface approach were slightly higher. Implications to tolerance for students who experience demanding learning experiences as a foreigner are discussed.
A Two-Year Longitudinal Study of Social Problem Solving in a Hungarian Context

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The aim of the longitudinal study was to investigate the development of social problem solving (SPS) among adolescents (N=210) in Hungary. At the beginning of the study (2009) the students were 12-year-olds and they were 14 at the last time of measurement (2011). The questionnaire of SPS was adapted (SPSI, D’Zurilla et al., 2002; Cronbach a above .85; KMO above .75). The SPS-factors were the following: positive and negative problem orientation (PPO, NPO), rational problem solving (RPS), impulsivity (I), avoidance (A). Beside children’s own evaluations, mothers and teachers also evaluated the children’s SPS in each year. The mother’s sample represented a range of Hungarian mothers’ educational levels in all years. Based on the self-assessment, NPO, RPS, I and A show increasing tendency with age. In the case of PPO significant differences have not been found. The mothers’ ratings are the same in the case of NPO, PPO and RPS, but they think that their 12-year-olds show lower impulsivity and avoidance than their children of 13 and 14 years. According to the teachers’ rating, NPO, RPS and A show increasing tendency with age, however, the values of I and PPO decrease with age. The correlations between children’s and mothers’ ratings are the strongest, and the most divergent evaluations were given by teachers and mothers. The family background (e.g. family type, parents’ educational level) play a major role in the development of SPS. Results are intended to be used as the basis for a development program in 2013/2014.

Occupational Exploration in German Secondary Schools

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The transition from school to work or to university presents an increasing challenge to students at German grammar schools because program offers at universities as well as opportunities in vocational training are exploding. To make an informed decision, students have to gather information relevant for their career choice and decide which occupation fits their interests and talents. Kracke or Blustein et al. call this kind of behavior ‘occupational exploration’. It is a predictor for job satisfaction and, as it is confirmed empirically - can be supported by parents. But we do not know how schools could foster exploration. In this paper we study (1) how students explore, (2) how schools foster occupational exploration and (3) how students perceive the support they receive from school. 279 adolescents answered a questionnaire about their occupational exploration process and about the support offered by schools concerning study and vocational orientation. Results point to a rather high level of exploratory behavior that is influenced by personality traits such as problem solving behavior and openness to new situations. Most students have at least a general idea what they want to do after school. Support offered by schools is generally seen as being useful.

Development of Elementary School Children’s Solutions of Non-Routine Word Problems

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The aim of this study was to examine the development in children’s solutions of non-routine word problems that violate four different misbeliefs about word problems, namely: (1) every problem has a solution, (2) there is only a single correct answer for every problem, (3) they always involve calculations and (4) all the data must be used in the calculation. 300 elementary school children, from 1st to 6th Grade, were individually interviewed when solving four kinds of non-routine addition problems that contradict these four beliefs, namely an (1) unsolvable, (2) multiple solutions, (3) solution given and (4) irrelevant data problem. Results showed, first, that in general accuracy scores were remarkably low. Second, there was a main effect of problem type, with 18% vs. 30% vs. 46% vs. 57% correct responses for the respective problem types, suggesting that some beliefs about arithmetic word problems are more established in children’s thinking than others. Third, the percentage of correct responses increased progressively with grade, however with only marginal progression in the upper grades. Finally, the pattern of problem type difficulties remained the same for all grades. In conclusion, the study showed that children’s incorrect beliefs about how school math word problems must be solved seem to be responsible for children’s failure in solving non-routine problem. Data also emphasize the weak effect of the formal math education on children’s non-routine problem solving skills.

Model space: Integrating understanding into dual-space theories of learning

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Learning new concepts by conducting experiments can be described as search in two spaces (Klahr & Dunbar, 1988): In hypothesis space, learners state hypotheses and infer rules, while in experiment space they test their hypotheses by experimenting. In their three-space theory, Burns and Vollmeyer (2000) suggested to add a third space, model space, which represents the current understanding and determines which hypotheses are taken into account. This study aims at finding evidence for model space using a computer based learning task in physics. Thirty-two psychology students first had their prior knowledge on torques tested. Then they learned about torques using a computer program for 35 minutes. This program included twelve interactive graphics in which they could manipulate levers and forces and observe the effects. Participants were asked to think aloud while working with the program. Finally their knowledge on torques was tested again. The resulting verbal protocols were analyzed using a newly developed coding system. Sentences were coded as referring to experiment space, hypothesis space or model space. All three postulated spaces could be identified in the verbal protocols. Model space could be validly covered by the coding system. The amount of model space correlates positively with final knowledge on torques and significantly predicts final knowledge beyond prior knowledge. The results suggest that model space is a useful extension of dual-space theories that permits to integrate understanding processes into learning theories.

Japanese children’s sensitivity to teacher vs. peer criticism
This research investigated the sensitivity to teacher and peer criticism of 89 Japanese 6-year-olds. The children were divided into two conditions: teacher condition and peer condition. They were given a common test battery, composed of sensitivity to criticism tasks (teacher or peer version), which used puppet-based stories based on Heyman’s teacher criticism tasks (Heyman, Dweck, & Cain 1992). The children’s response to criticism (teacher’s criticism in teacher condition, or peer criticism in peer condition) was measured by focusing on the following three dimensions following criticism given about a small failure: emotional response, rated ability, and motivation to persevere. The results showed that the children in the teacher condition showed lower ability rating and more motivation to keep trying after criticism than the children in the peer condition. Moreover, in the teacher condition, persistence did not decreased after criticism compared to persistence after just making a small error, which was not the case in the peer condition. These results suggest that teacher criticism after a small failure is not detrimental to Japanese children’s perseverance.

Responsible teaching, sustainable learning, a fairer world: Employing the lens of ‘authenticity’

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In this theoretical paper I shall make three fundamental claims, analyse their relationships and substantiate these by reference to existentialist, critical and communitarian theories of ‘authenticity’ and learning as well as the capabilities approach to human development (Sen & Nussbaum, 1993; Nussbaum, 2000, 2011; Walker, 2006; Walker & MacLean, 2013). The three claims are: (1) academics who engage in university teaching authentically are motivated by a duty and commitment to serve the important interests of students; (2) the important interests of students are their own growth towards greater authenticity; (3) promoting students’ authenticity has implications not just for students’ academic learning and personal flourishing but also for creating greater social justice in the world. The paper concludes with suggestions for further research and the actual practice of university teaching, addressing, in particular, implications for educating future professionals. Focusing on the education of professionals is both deliberate and timely. It is deliberate given that graduates from ‘professional subjects’, perhaps more so than other graduates, are in a position to exert a real influence on many of the social justice issues characterising our highly stratified societies through the actual work contexts they enter into. It is timely given the current status of the professions, making it urgent to explore whether a sense of professionalism grounded in the professionals’ own ethics, judgment and inner disposition to act in the interests of the ‘public good’, rather than in compliance with external policy or self-interest, can be purposefully fostered through higher education curricula and pedagogies.

Teachers learning to provide learning enhancing feedback: a pluriform professionalization trajectory

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In this study we aimed to professionalize a team of experienced teachers in a school for lower vocational education in providing feedback in the classroom. 23 teachers participated in the program that was based on three principles: (a) providing theory on learning enhancing feedback, (b) interventions inside and outside the classroom and (c) interventions aimed at three levels, the individual level, small group level and whole team level. Teachers provided significantly more learning enhancing feedback after the program.

Preservice Teachers’ Capacity to Teach Self-Regulated Learning: Analysis of Classroom Videos

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The study focused on central question: how do teachers acquire the necessary expertise to positively develop students’ self-regulated learning (SRL)? Preservice mathematics teachers (N=132) were divided into three groups which analyzed four videotaped, authentic classroom, mathematics-teaching vignettes. One group was ‘fully-supported’ and had access to an edited clip explicitly focusing on reciprocal teacher-student interactions and two separate close-up clips of teachers and students. A second group, which was ‘partially-supported’, had access to an unedited wide-angled whole-class clip and the two close-up clips (teacher and students). The control group had access to the whole-class clip only. All groups used digitized interface for viewing and all received a rubric for categorizing the three components (cognition, metacognition, and motivation) of the SRL events. The results indicated that the fully-supported preservice teachers improved more in their professional vision and actual teaching of SRL strategies, compared to the other two groups. The control group improved the least. The study offers an important contribution to pre-service teacher training, focusing on improving teachers’ professional vision skills: recognizing and categorizing classroom SRL events and teaching SRL strategies.

Visual problem solving in complex cognitive tasks: Expertise development in air traffic control

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Trainees in complex visual domains (e.g., medical specialists, power plant controllers, pilots, air-traffic controllers) must learn to interpret available visual information to base on fast and errorless decisions. A gain in training can be obtained by focusing on the direct acquisition of the skills to make decisions based on those visualizations. Eye-movement modelling examples can help students to learn to solve visual tasks. Therefore more knowledge is needed about domain specific strategies in different groups of expertise and how optimal task solutions contribute to training improvement. This study compared participants (N=31) of three different expertise levels in interpreting and solving air traffic situation from radar representations. We firstly expected to unravel visual problem-solving strategies and secondly we expected experts to perform more similar than intermediates and novices. ATC task solution and correctness score, mental effort, and eye movements were recorded and analyzed for nine tasks. Eye tracking data revealed novices to use means-end problem solving approach, while more expertise leads to more developed visual problem solving process. Moreover, eye-movement characteristics showed that more expertise yielded more efficient visual problem solving strategies emerging from efficient relevant information retrieval and efficient scanpaths. Results also revealed more similar task solutions for experts compared to intermediates and both groups were more similar than novices. These results are discussed in terms of implications for training of visual problem solving in a perceptual task.

Impact of Trainers Professionalism and training activities on VET-Dropouts in Swiss Dual System

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The VET system in Switzerland is organized in a so called ‘Dual System’, where the trainees have an apprenticeship contract with the companies. A main topic for politics, practice and research is the fact that each year up to 25% of those contracts are terminated prematurely. Contract terminations are associated with high costs for society, the company, and the young people. A decrease of contract terminations is therefore highly desirable. The reasons of premature contract terminations (PCT) have primarily been explored in studies with a focus on the characteristics of the trainees. The role of the training company and the trainers has received only little attention. In this paper we will analyse the impact of trainer’s professionalism on VET-Dropouts. To answer this question, we will compare trainers from training companies without contract terminations with trainers from companies with contract terminations. In the study we are focusing on painters and on cooks. The
representative sample of this cross-sectional study consists of about 800 trainers from the German-speaking part of Switzerland.

**Connecting Principal Succession and Professional Learning: A Cross-case Analysis**

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The purpose of this interpretative qualitative study was to explore the connections between principal succession and professional learning through the analysis of the current practices in leader identification, development, support, and retention in two Georgia (USA) school districts. The findings of the cross-case analysis revealed that leader professional development and succession were tightly connected on the levels of leader preparation, support, and retention. The analysis emphasized the importance of a visionary superintendent to ensuring leader development and continuity and the districts’ preferences of the locally developed aspiring principals who participated in the alternative non-university leader preparation programs. Overall, in light of the anticipated principal turnover, growing leaders from within the district has emerged as an effective way to ensure leader continuity. The findings of this study contribute to the literature on educational administration by exploring the practitioners’ beliefs about the principalship and offer implications for principal preparation, socialization, and professional development. The study enriches the body of research on principal succession and professional learning and suggests implications for redesign of the university leader preparation and district-based professional development and leader succession planning.

**The Art of Conducting: Insights into Practice Activities**

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In the domain of music, it is often talked about talent or giftedness. Especially a conductor fascinates the audience and creates a picture of a talented maestro. However, based on expertise research, it is argued that not talent is the key factor but rather disciplined, persistent, and goal-oriented practice that makes perfect. This study offers some insights into the field of conducting, which still is little explored. Qualitative and quantitative characteristics of practice activities were investigated and the influence of playing an instrument was examined. Participants were 34 conductors in training. A questionnaire was developed to capture students’ professional development including biographical data, formal musical training, instrumental biography, and practice activities. The results of the study show that deliberate practice plays an essential role in conducting and important practice activities could be identified. Investigating practice activities in a creative domain like music, in particular
conducting, will help us to better understand the important factors involved in the professional development. This understanding on when and how to practice is relevant for responsible teaching and sustainable learning in a complex professional field.

Participation, dialogue and learning: sustainable fisheries and the case of co-management

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More inclusive forms of governance are increasingly advocated that allow for stakeholder participation and joint capacity building. Platforms for dialogue and the exchange of knowledge are seen as one tool to integrate different knowledge systems such as science and local knowledge. In this study, we examine a Swedish Co-management Initiative of fisheries using an integrated version of Plummer and Fitzgibbon’s ‘Adaptive Co-Management’ (2004) and Seneca’s ‘Trinity of Voice’ (2004) frameworks in analysing the participation process, communication, and learning outcomes. The results show that participating actors were successful in developing trust and enhancing learning, starting with a conflict situation and diverging interests. Attention to ‘access’ and ‘standing’ as part of participation, and skilled facilitation, were key issues in achieving these results. The article provides insights with regard to the use of established frameworks, here applied to an empirical case, enhance our understanding of learning in conflicted contexts, and helps practitioners in designing and institutionalizing learning processes and platforms in other contexts.

University students’ knowledge construction during collaborative writing face-to-face

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Collaborative writing combines social processes of writing with cognitive knowledge construction processes, which may lead to deeper learning than individual working. This study aims at clarifying collaborative knowledge construction included in discussions between students during composing joint essays. University students (n=21) prepared themselves for collaborative work by reading developmental theories and writing individual summaries of them. The students in small groups discussed the theories and then wrote a joint essay on one of the theories. The data consist of the students’ individual summaries (n=21), discussions (8177 speech turns), and joint essays (n=6). The sentences (n=179) in the students’ joint essays were analyzed into the following categories: copied
literally from one student’s individual summary; reformulated from one or more students’ individual summaries; composed by utilizing the course book; and created during the group discussion. The students’ group discussions were divided into text fragments: idea reformulation (n=100); text book consulting (n=32); and creation of a new idea (n=10). The utterances inside the fragments were analyzed by observing both social interaction (collaborative completion; questions; answers; agreement; disagreement and revising), and content processing (expressing an idea; conceptualizing an idea; and clarifying an idea). The results showed that the students revised texts mostly in reformulation fragments and completed ideas collaboratively when consulting the text book. Disagreement surfaced during the reformulation of previous texts, but the students hardly ever expressed disagreement when they consulted the text book. The results are discussed from the perspective of learning where both social interaction and cognitive processes are in focus.

Do Participants’ Hierarchical Positions activate Homophily within Communities of Learning?

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Communities of Learning (CoL) are promoted to foster interpersonal knowledge transfer among participants of organizational training initiatives. Moreover, previous studies have posited that homophily can significantly affect the communication processes among participants that exhibit differing background characteristics. However, past research has largely neglected a particular background characteristic, namely hierarchical positions, which have been suggested to constitute a major obstacle for collaborative learning processes. By providing empirical evidence from 25 CoL of a global organization, where participants from different parts of an organization’s hierarchical ladder collaboratively enhanced their knowledge and skills, the current study addresses this shortcoming and investigates whether and to what extent the applicable CoL have been subject to homophily. Based on an underlying social network analysis, our results show no signs of homophily. Instead, we rather find an ‘externalness’, whereby participants particularly turned to colleagues from outside their own hierarchical position. By incorporating these findings into the design and implementation, organizers of future CoL can device learning activities and facilitation strategies that can further enhance participants’ learning experience and outcomes.

Improving Reading Fluency through a Peer Tutoring Programme

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The study is focused on the impact of a peer tutoring-based programme on reading fluency in Spanish students. The research was conducted on a sample of 98 students from the fourth and fifth
year in primary school, and on a comparison group of 71 students and 5 teachers who structured the process of the reading sessions. The data for this study was gathered by means of a quasi-experimental study with a comparison group, combined with the analysis of the working sessions of a sub-sample of 12 pairs in order to learn about their performances during the tutoring sessions. The results revealed significant advances for all the students in regards to reading fluency, regardless of the tutoring modality assumed (fixed or reciprocal), or the role performed (tutor or tutee). The analysis of the process showed that the independent reading techniques implemented (modelling; paired reading; Pause, Prompt & Praise,PPP-; and teaching self-monitoring) have contributed to developing accuracy, prosody and reading comprehension. The study revealed that the tutors implemented spontaneous mediation mechanisms in order to give feedback and facilitate the process of reading comprehension through prompting, pausing and splicing. Previous training for the students is suggested for the paired reading due to its difficulty.

Using permanent small groups’ model (PSG) to enhance peer likability among secondary school students

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This paper presents the analyses and results of peer-reports within classes during an intervention study with Permanent Small Groups inside classes. The PSGs are an integral part of everyday school work and whenever the students are expected to work in collaborative learning groups, it takes place in PSGs. The effect of PSGs was assessed in two cohorts of students in classes with and without PSGs. In both 8th and 9th grade, students filled in a socio-metric questionnaire in which they rated all classmates on in and outside the classroom relationships. The average of these peer-reports on a classroom level is viewed as an indicator of likability between students in the classroom. The results show that in the PSG classes average ratings related to in and outside the classroom relationships increased significantly. There were no significant changes in non-PSG classes. This indicates that PSGs enhanced likability among students in a classroom.

First graders’ peer nominations as predictors for later academic performance

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Our study extends previous knowledge of peer relationships and children’s social status on first grade by examining the associations of acceptance and rejection with more than one behaviour trait (bullying, victimisation, and social withdrawal) and their relation to motivational orientations, word recognition skills, and number sequence elaborating skills. The data gathering started in middle childhood and the longitudinal influences are measured five years later at 6th grade where average grading for all school subjects, grading in mathematics, grading in mother tongue (Finnish) and students’ behaviour are used as performance measures. Altogether 184 first graders (103 boys, 81 girls) were involved in the study at their first spring in the school, at the age of 7-8 years. The results indicate that we can explain in at best almost 26% of sixth graders academic performance by their earlier motivational task orientation, early mathematic skills and, especially their peer’s sociometric nominations that relate to peer’s rejection. The study especially contributes in indicating how powerful explanation was found along first graders’ avoidance behaviour reported by their schoolmates. The other important contribution of the study is to draw a bigger picture out of the complex phenomena.

Speaking and listening online: Relationships between behaviors in asynchronous discussion forums

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Two core activities contributing to knowledge construction in online discussions can be conceptualized as ‘speaking’ (contributing posts) and ‘listening’ (accessing existing posts). Previous research has informed our understanding of how students engage in each of these activities; however the relationship between the two has been infrequently explored. The aim of this study was to empirically examine the connections between students’ speaking and listening behaviors in asynchronous online discussions. Thirty-one students from an undergraduate educational psychology course participated in six week-long small-group discussions. Eleven variables were calculated indexing four dimensions of student’s listening (breadth, depth, temporal contiguity and revisitation)
and posts were coded for five variables indexing three dimensions of students’ speaking (discursiveness, content quality, and reflectivity). Multi-level mixed-model linear regressions indicated that responsiveness of student posts was positively predicted by how often they revisited peer posts read previously and negatively related to a greater number of posts in the discussion overall. Post content quality was predicted by the percentage of posts viewed that students actually read (as opposed to scan). Put together, results suggest that when students take the time to read and re-read their peers’ posts there are related benefits for the responsiveness and content of the posts they contribute. In contrast, when discussions are prolific, the average level of responsiveness declines. This is the first work we are aware of that provides empirical evidence to support the connection between listening behaviors and speaking quality. Understanding this relationship may suggest new ways to support students in effective discussion participation.

How do Collaborative Interactions Influence Students’ Learning Outcomes?

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This study explored how the quality of dyads’ interaction influences the learning of material science and engineering concepts. Twenty four dyads’ (n=48) knowledge and understanding of atomic bonding and physical properties of materials was measured using pre and posttest design; and compared to a control group of individual students (n=24) in solo settings. Results showed dyads in collaborative condition did significantly better than the students in control condition. The verbal analysis of the students’ dialogue indicated a strong correlation between the quality of interaction and learning gains. When the statements and responses of each student build upon those of the other, both students benefit from the collaboration. In addition, the verbal analysis revealed no significant difference between gain scores of students in solo condition and dyads with lower interaction scores in collaborative condition. Therefore, these results suggest that the quality of interaction is a significant factor for the effectiveness of learning in dyads.

Early child-centred stimulation of reading comprehension

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Kindergarten children (mean age: 37.9 months) were given a treatment based on a special kind of ‘dialogic reading’ (Zevenbergen & Whitehurst, 2003; Mol, Bus, de Jong & Smeets, 2008) with the specific aim of enhancing that component of comprehension ability which consists of making connective inferences when processing a story made up of pictures, i.e. of enhancing an important component of reading comprehension. The active and self-regulated role of the child that is
characteristic of dialogic reading was increased by replacing any other speech act of the instructor with the reflection-response, defined by Carl R. Rogers (1951) as the speech act most effective in encouraging the addressee's autonomous cognitive and verbal activity. The prediction was that just a few child-centred individual sessions would be sufficient to significantly increase the ability to make connective inferences, the measure of which was the dependent variable of the research. 15 children were given 3 sessions (mean duration: 40 minutes) of treatment while 15 others matched on pre-test scores only participated in normal kindergarten activities. The post-test gain scores of the experimental group were significantly higher ($F = 21.08235$, $p = .000085$; $U = 18,00000$, $p = .000089$) than those of the control group. This outcome is discussed with reference to the importance of high-quality early stimulation of literacy, specially when the children come from economically disadvantaged families and are more unlikely to be school-ready (Kagan & Rigby, 2003; Kauerz, 2008).

Constructing the participation framework during story reading activities in preschool

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This qualitative study investigates the construction of participation frameworks in multicultural preschool interaction. In view of any sustainable learning, it is of particular interest how students, having the curriculum language as a second language, deal with the ongoing interaction during a story telling activity. Noticing, taking up, processing and responding to the cognitive and social input are crucial competencies, which have been introduced by the Ministry of Education as an essential reformation of the system to meet the demands of a knowledge society (MEN, 2011). Data has been collected in a Luxembourgish preschool with Lusophone and Luxembourgish students. The video show the children listening to a story told by the teacher on the one hand and reading that same story book without an adult on the other hand. The analysis proceeds by a sequence-by-sequence analysis of the joint construction of the participation framework focusing on the children ‘doing being’ the listeners in the multicultural schooling context and sheds light on topics such as positioning and negotiation of positioning, ratification of topics, relevance of a particular mode of interaction etc. (Goodwin 1981, 2000). Hence, the results show different modes for making sense of and interacting with the environment such as teachers and children constructing the participation framework of listening within the institution school, movement/silence and interruption/sequential turn allocation.

The evaluation of the German initiative ‘Early Chances”: First results

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In Germany, currently 4,000 day-care centres are developed into so-called ‘core day-care centres for language & integration’. As part of this initiative the involved day-care centres are allowed to appoint an additional professional qualified to promote language learning in the day-care centre. A focus of the initiative is in particular the promotion of children below the age of three with an immigration background or from less well-educated families. The evaluation is set up to investigate the effects of the initiative on the involved day-care centres, the educational staff within the centres and team collaboration, the pedagogical quality, the children and their families. The current study is based on the first measurement point and aims at answering the following research questions: How was the initiative ‘Early Chances’ implemented and what kinds of realizations exist within the initiative? How are different realizations related to the process quality? The findings indicate that every third day-care centre perceived a need for further training and support when the initiative started. 52.6 % work mainly with the children rather than working with the team or the parents. The associations between different realizations, preschool teachers’ beliefs and the process quality will be further explored. The findings give valuable insight in how large-scale national programmes are implemented in practice.

**Assessment of Children’s Early Learning and its Effects on Child Care Quality**

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Constant assessment of children’s early learning is understood as a key element of early childhood education. The method of systematic observation and documentation of children’s learning called ‘Learning Stories’ developed by Carr (2001) in New Zealand and adapted for German-speaking countries by the German Youth Institute (Leu et al., 2007) is therefore commonly used in childcare centres. However, up to now there are no evidence-based findings on the extent to which systematic observation and documentation of children’s learning further develop, as it is assumed, the quality in the early childhood education and care system. The study is based on a control and comparison group design with two respectively three measurement points: prior to the beginning of implementing systematic observation and documentation of children’s learning (baseline t1, September 2009), at the end (outcome t2, November 2010) and one year after the implementation
The sample consists of N=38 childcare centres: n=12 as intervention group working with ‘Learning Stories’, n=13 as a control group and n=13 as a comparison group working with another method, developed by the German Infans Institute (‘Infans Concept’, see Andres & Laewen, 2011). Child care quality is assessed via standardized written questionnaires by the teaching personnel and childcare centre directors and via standardized external observations. Results demonstrate significant effects of systematic observation and documentation of children’s learning on the quality of early child care and education: As expected the intervention and comparison group show higher quality ratings than the control group.

On the assessment of attitudes towards the study process and the university

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The purpose of the research was to develop and validate an instrument for the assessment of attitudes towards the study environment in higher education contexts. The questionnaire is designed to measure students’ attitudes towards two particular objects: the university (or Higher Education Institution) and the process of studying. Five studies at two different universities were conducted to develop and validate the Attitudes towards the Study Environment Questionnaire (ASEQ). In total, 1640 students filled in the questionnaire. Reliability tests, exploratory and confirmatory factor analyses showed satisfactory psychometric characteristics of the ASEQ. Each part of the questionnaire is internally consistent and construct validity of the scales is supported by correlations with other constructs, e.g. positive attitudinal constructs are positively related to intrinsic motivation and the expected study performance. Since attitudes towards the study environment are connected to student engagement and motivation, the study contributes to the theory of student learning by providing a validated instrument to assess attitudes. Thus, the ASEQ can support further research on student performance and development. Also, the questionnaire can be used as a diagnostic instrument for higher education faculty and administration to trace students’ attitudinal development over time, a factor of prime importance for student socialization during the introductory phase of studying.

Faculty development as an organisational phenomenon – An empirical case study

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Faculties are important organisational units of higher education institutions. Nevertheless their character and functionality have been considered very rarely. This lack of research is addressed by the following research project. Based on several mainly sociologically based organisation theories one exemplary faculty is reviewed. The research aims at exposing how members of a faculty perceive and act within the faculty. The results of the examination will be analysed and arranged in the discourse of designing faculty development. Implications will be deduced regarding the arrangement of study programmes as a central aspect of faculty development.

Drop-out and change of discipline: evidence for the impact of motivational and personal factors

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In this study 1546 students of different faculties were asked about their central motives and big-five in order to analyze the influence of these parameters on the subject choice and on a tendency to change the subject or to drop-out. In order to take into account the complexity of human motivation a differentiated measurement of the students’ motives was taken. Both the dimensions approach and avoidance motivation and the dimensions intrinsic and extrinsic motivation have been accounted. main results of this study are: Students specializing in different subjects differ in their motivational attitudes, especially with respect to their approach motive structures. The tendency to drop out of university or to change the subject entails high avoidance motives and low achievement and self-control needs. These empirical findings have also educational relevance for the Student Advisory Service: among others stability and study success can be increased by a transformation of the students motive structures. Particularly the combination of low intrinsic approach motivation to achieve or to self-control accompanied by high global avoidance motivation seems to be an obstacle for graduating successfully.

Against Sustainability: rethinking the human(e) in teaching and learning

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This paper challenges the metaphor of sustainability in education, based upon notions of sustainable eco-systems in the natural world. While acknowledging the good intentions of such metaphors, I suggest that they are limited, unsustainable, in their application to the very human context of teaching and learning. My argument is based on two foundations and the first part of this paper explores each of these. Firstly, I critique the overly benign way in which metaphors such as eco-systems and sustainability are taken from the natural world and applied to the human; secondly, drawing on the critical theory of Theodor Adorno, and particularly notions of non-identity and negative dialectics, I seek to reaffirm the unsystematic nature of human encounters and learning, and hence the potentially inhumane consequences of approaches that seek to reproduce notions of order where none can, or should, exist. In the second part I develop these arguments in the context
of three aspects of teaching and learning within higher education. In doing so I seek to acknowledge some aspects of the ‘sustainability’ literature, but then explore how we can transcend these, using the lens of Adornean theory, to a more meaningful application within the human world. These three aspects are: a critique of the use of pre-determined learning outcomes; an examination of assessment practices and the extent of mismatch between these and social and individual theories of learning; and the relationships between teacher and student (predator and prey?).

Personal Tutoring in UK Universities – prospects for sustainability of an invisible practice

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Personal tutoring has been described as a characteristic asset of UK higher education, one which must be resourced and sustained. This paper reports on research using reflective practice with UK personal tutors to discover the essence of this invisible practice. The study uses an analytical framework based on Goffman’s The Presentation of Self in Everyday Life (1959) and Habermas’s Theory of Communicative Action (1984; 1987) to explore the fact that personal tutoring occurs in private, or invisible space. If the practice is to be properly understood for the purposes of evaluation and quality, methods must be found which make it more visible. This study used facilitated reflection with personal tutors to make their practice visible and open for exploration and discussion. Participants made changes to their practice as a result of taking part in the reflective study, but their reflection was not sustained once their participation had ended. The data revealed a lack of discussion about personal tutoring had resulted in inconsistent practice, the purpose and process of which were not collectively understood. If personal tutoring is to be developed and sustained it must be made visible via collegial discussion and reflective practice, and its underpinning moral and educational purpose clearly articulated.

Quality as Transformation: Educational Metamorphosis

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The notion of ‘quality as transformation’ has been widely used in the higher education sector. However, both quality and transformation are elusive terms. There is little research exploring whether quality could be equated to transformation in the learning process. This paper will provide an insight into the relationship between quality and transformation at doctoral level. Using data from interviews with 32 PhD supervisors and students in two English universities, and the outcomes of a collage-making workshop, this paper will reveal how student transformation was perceived as relating to quality learning. Transformation was depicted as involving different forms of development, such as emotional, physical, critical, intellectual and personal. Whilst quality was interpreted as instrumental, mainly related to indicators for assessment purposes.

The impact of teaching development programs: Assessing different dimensions of progress

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University teaching development programs for academic staff typically have a range of different educational goals, ranging from gaining basic proficiency in teaching to the more fundamental goal of changing teachers’ conception of teaching towards student focused conceptions. In the current paper we shall explore the development of four dimensions of teacher development in a teaching development program (~10ECTS) at the University of Copenhagen. The two most important dimensions considered are the teachers’ conceptual change student focus (as measured by the Approaches to Teaching Inventory), and the development of teachers’ self-efficacy beliefs with respect to teaching (as measured by a modified version of the Science Teaching Efficacy Belief Instrument). We find significant improvements with respect to both of these dimensions in several recent courses. No significant changes are found with respect to the Information Transfer Teacher Focus of the ATI or the outcome expectancy beliefs of STEBI. The paper discusses which elements of our course design we think are conducive for the development of teacher self-efficacy beliefs and conceptual change student focus respectively, and presents a model for relating the dimensions of progress to each other.

Which comes first? Predicting satisfaction, commitment and need fulfilment among university students

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Satisfaction and commitment are among the most studied attitudinal outcomes in the human sciences. As educators, we want our students to be satisfied, committed learners, knowing that their attitudes reflect the nature of their personal learning experience, and relate to important outcomes such as retention (Tinto, 1993). Substantial work across the educational and other literatures suggests that humans have both intrinsic and context-specific needs, whose fulfilment is associated with positive attitudes, along with other important individual and system-level outcomes (e.g., Kristof-Brown, Zimmerman, & Johnson, 2005; Tinto, 1993). In general, need-attitude theories suggest that need fulfilment precedes the associated attitude(s). However, while there are good reasons to affirm a causal relationship between need fulfilment and individuals’ context-specific attitudes, the direction is usually assumed rather than tested. This study tested the strength and direction of the relationships between university students’ perceived academic and social need fulfilment and their levels of satisfaction and commitment. Participants were 478 undergraduate students, enrolled in one of seven Stage One papers at a large New Zealand university. Students completed measures of academic and social need fulfilment, satisfaction and commitment both mid- and late-semester. Responses were matched using personal codes and structural equation modelling software (AMOS) used to test cross-time associations between each of the need fulfilment and attitude measures. The results have interesting implications for higher education theory and practice, which will be discussed.
The interaction of self-regulation, deep learning, self-efficacy beliefs and emotions

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This study explores the development of self-regulation skills of university students. Firstly, the aim of this study is to analyse variation in self-regulation skills of university students at the beginning of their university studies. Secondly, the purpose is to explore interaction of self-regulation, deep learning, self-efficacy beliefs and emotions. The data were collected through the students' interviews. The data were analysed using inductive content analysis. The results showed that there was variation in students' self-regulation skills. In general, students, who scored extremely highly on the deep approach to learning, also showed excellent self-regulation skills. These students set their own goals for studying and they studied regularly. They were good in time management and organising studies. In addition, they were also optimistic about their studying and possible challenges in studying. Students, who scored on average on the deep approach to learning or whose scores in the deep approach decreased during the course expressed some problems in self-regulation. These students described problems in planning their studies and in time management. Furthermore, they showed a tendency to procrastinate. In addition, the results implied that students used more co-regulation in courses which emphasised collaboration.

The growth in learning patterns during higher education: a latent growth curve model

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Whether learning strategies change during higher education is increasingly investigated. To assess this, paired-samples t-tests or repeated measures ANOVA are primarily relied upon. Recently, latent growth curve modelling has been described, allowing to model individual difference and to take into account measurement error. This study thus aims to estimate longitudinal change in learning strategies, using a latent growth curve analysis. The sample consists of one cohort of bachelor
students, 245 of which participated in the three measurement waves by filling out the Short Inventory of Learning Strategies (SILP), a self-report instrument mapping students’ processing and regulation strategies. A curves-of-factors latent growth model is used. Such analysis estimates a growth trajectory by an intercept and a slope and estimates the variance in both parameters as well. Preliminary results indicate a significant increase in critical processing, relating and structuring as well as self-regulation during higher education. Memorising, external regulation and lack regulation decrease significantly, while analysing remains constant. For all scales, students vary in their initial level at the start of higher education, while no significant differences in growth trajectory were noted. Results from prior research are thus partially confirmed and supplemented with findings on individual differences.

**Students regulate their learning processes as a function of multimedia coherence**

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This study investigated students’ regulation of learning processes across science multimedia. Within an adaptive, hypermedia learning environment, 81 university students were presented 38 pages of texts and images of the circulatory system. A subset of 4 pages were rated for high or low coherence between text and image. Participants’ learning strategy behaviours (i.e., seeking out, attending to, and integrating relevant multimedia content) were assessed by aligning eye-tracking and computer-based learning environment log-files. Subsequent learning achievement was assessed with a multiple choice posttest. Result show that students regulated their learning processes as a function of text-image coherence, which was related to learning achievement: processes on high-coherence pages positively related to learning, whereas processes on low-coherence pages negatively related to learning. Implications for theory and educational practice are discussed.

**Longitudinal relations between the learning environment and self-regulated learning**

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In order to stimulate self-regulated learning many secondary schools in the Netherlands have implemented innovative learning environments with a focus on the learning process. In this study we compared students’ perceptions of the learning environment and self-regulated learning in innovative schools with more traditional schools. In addition, we investigated how the development of self-regulated learning was related to students’ perceptions of the learning environment. 701 students in secondary education participated in the study. Five schools were classified as having an innovative learning environment. Eight schools had a more traditional environment. A self-report questionnaire was administered five times during the first two years in secondary education. Self-regulated learning was measured using scales for math investment and metacognitive strategies. The learning environment was assessed with scales for autonomy support, emphasis on relevance and well-being with teachers. Auto-regression models were used to analyse the data. In line with our expectations, we found that students in innovative learning environments experienced more autonomy-support and more emphasis on relevance than students in traditional schools. No effects were found, however, for well-being with teachers. In addition, students in innovative schools reported more self-regulated learning and perceptions of the learning environment were positively related to self-regulated learning. The results emphasise the importance of recognizing students’ own perspectives by offering them choices and to emphasize the relevance of what is being learned for students’ own lives. Schools that have implemented an innovative learning environment as described above seemed to succeed better in doing so than more traditional schools.

Online diagnostic assessment of foreign language vocabulary of 6th graders

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The aims of the research were to develop online diagnostic test batteries for the assessment of English and German foreign language vocabulary of students, and to test the following hypotheses: (1) equivalent contents, structures and task types of the tests result in similar student achievements; and (2) studying instructions and examples of the tests results in higher student achievements. Two online diagnostic test batteries of three tests were developed. Both triplets covered the same basic vocabulary outlined in the national curriculum, and all tests were developed using the same test structure. The task structure was also the same in all cases. Tasks were administered using the eDIA online diagnostic assessment system that stored both item responses and task-solving times. The sample comprised altogether 220 6th graders (12-year-olds). The tests were of good reliability. The achievements on the English tests were higher, similar contents in different languages resulted in significantly different test difficulties. But, similar test structures in the same language resulted in equivalent tests. The results of the task types showed the same tendencies, with significant differences between the two languages. Test- and task-solving times demonstrate that computer-based testing can be an effective method of data collection also in the case of foreign language vocabulary. Our results show the role and the importance of studying the instructions and examples. The online testing of foreign language vocabulary can be regarded as a new, motivating and effective assessment method in this field.
Assessment German as a Foreign Language Basic Vocabulary of 6th Graders

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The study investigated of 6th graders’ (12-year-olds) basic German vocabulary. Learning words is traditionally important in the acquisition foreign languages. The specific levels and qualities of vocabulary are conditions for the development of language skills. According to literature, students should directly acquire the most common words of a foreign language so that they will be able to enrich their vocabulary implicitly, through reading. Picture association is a widely used method in acquisition of new words and they can also be used in the assessment of students’ word knowledge. This research aimed at testing a measurement tool of word knowledge with visual stimuli. The pilot study focused on the students’ test results, on the similarities and differences between the word knowledge of high- or low-achieving students’ test results and on the correlations between various factors of students’ vocabulary and their test results. The students’ performance in the three test versions did not show significant differences. There are no significant differences between the results in the bottom quartile and between the results in the top quartile, comparing the three test versions. Performances show significant differences in the lowest and in the highest quartile along various dimensions and these factors show a close correlation with the test achievement on each test version. The measurement tool and the online assessment procedure provide both the student and the teacher with immediate feedback on the extent of the word knowledge acquired and outline future tasks in learning and teaching.

English and German as a foreign language: Differences in the vocabulary of 6th graders

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It has been widely accepted that the level of foreign language vocabulary influences the general language proficiency and students’ school success mostly at the beginning of their language learning. Therefore in the present pilot study we aimed to examine (1) the possibility of the comparative assessment of English and German word knowledge of 6th graders (12-year-olds) who have learnt foreign language for two or three years, and (2) the differences in students foreign language vocabulary. For this purpose three parallel structurally and empirically equivalent online test versions were developed in English and German. The reliability (Cronbach’s alpha) of the tests varied between
0.75 and 0.92. 127 6th graders comprised the English and 93 students the German sub-samples. The results show that the developed picture-based vocabulary test provides a reliable and efficient method of assessing students’ knowledge. It has been established that significant differences characterize English and German learners’ vocabulary in terms of word frequency, level and word class. As this pilot study is embedded in a large project to assess students’ first and foreign language skills, in this framework it is also possible to analyse the causes of these differences in foreign language vocabulary achievements.

The function of language use in knowledge formation

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The function of language use in knowledge formation Elsie Anderberg, University, Sweden Abstract The function of language of use in knowledge formation has not received a great deal of attention in research on learning. This is problematic since learning as verbal reproduction of knowledge does not guarantee learning as understanding. The intentional-expressive theory addresses aspects of how the function of language use in knowledge formation is constituted. The purpose of this paper is to describe and discuss the concept of meaning within this theory. The discussion is based on a series of empirical investigations undertaken, and concerns how the intended meaning of verbal expressions used in an explanation expresses the content of understanding in the process of knowledge formation. The paper consists of four parts: an introductory section provides a brief overview of the intentional-expressive theory, outlining the background in phenomenographic research in learning to its development, followed by a description of certain characteristics. The third section constitutes the main part of the paper, where the theory is discussed, regarding how the content of conceptions and verbal intended meaning is constituted in the formation of knowledge about objects. The concluding section discusses the importance of paying attention to the function of the interplay between language meaning use and knowledge formation in the classroom, to reduce verbal reproduction and promote in-depth knowledge formation.

The mediator role of writing conceptions on students’ gender differences in writing performance

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The purpose of this study was to investigate writing conceptions and writing self-efficacy beliefs held by secondary students in relation to the students’ gender as well as their associations with writing achievement. Results show that girls hold more sophisticated writing conceptions than boys and tend to obtain higher writing performance scores. However, no gender differences were found in writing self-efficacy beliefs. Regression analysis reveal that writing conceptions, writing self-efficacy beliefs and gender play an important role in predicting writing performance and, furthermore, that the relationship between gender and writing performance is mediated by students’ writing conceptions. Educational implications and further research are discussed.
The potential of observational learning for collaborative synthesis writing in a foreign language

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Observational learning has been shown to foster effective results both for synthesis writing and for peer revision in a foreign language. Does the positive effect of observational learning still stand if peer collaboration and foreign language synthesis writing are combined in an online setting? If so, where exactly in the writing process can the added value of the model be located? And how does this contribute to the quality of the final product? These questions form the starting point of this paper. The answers are based on the results of an intervention study in two institutions of higher education (n = 90). During the intervention, the students wrote two syntheses in collaborative groups of three, using an online editor and following a script with stepwise instructions on how to organise the collaborative process. A cross-sectional design between an experimental and a control condition was set up. In the experimental condition, students watched a screencast video as a model for the collaborative revision process. In the control condition, students followed only the script. The data comprise screencast videos of the collaboration process, and the final texts produced. The units of the process analysis are peer feedback instances followed by an editing event. Preliminary findings and previous scholarship lead to the hypothesis that more editing activities regarding higher-order concerns take place in the experimental condition which leads to a better text quality in terms of content selection and coherence.

Creative writing – a journey into the imagination and beyond

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Creative writing is the product of a fictional narrative or written representation (Carreti et al., 2012). The goal of this study was to identify the variables underlying creative writing and to build a path model in which three different research fields wherein creative writing is studied are combined. The
research field wherein creative writing is studied are visualization (Caretti, Re & Arfà, 2012), text variables which are related to embodied writing (sense, situational and abstract words) (Baker, Gersten & Graham, 2003) and text comprehension (Groenendijk et al. 2008). A sample of 161 fifth-, sixth- and seventh graders wrote a novel about what they would do if they were invisible for one day. The creativity (subscales: story structure, novelty, emotion, individuality, style of stories) was measured and the amount of situational and sensory words was counted. In addition, a text comprehension task and a visualization task were administered. With the path model it is possible to explain more than 40% of the variance in creative writing skills. The findings show that text comprehension only indirectly influences the creativity of writing via text production variables. This is in contrast with previous literature which state that there is a positive correlation between text comprehension and creative writing in older children. Further research is recommended. Moreover, visualization and text variables which are related to embodied writing and abstract words seem to have a high impact on the creativity of the novel. Within the school curriculum more attention should go to visualization skills of children.

Writing strategies for argumentative discourse: a quasi-experimental study with high-school students

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This exploratory study aimed at investigating the relationship between writing strategies and the quality of oral and written argumentation in 124 high-school students. Half participants attended a series of workshops on writing to argue led by a researcher, while the other students were involved by their teachers in regular classroom activities. In order to analyze students’ abilities in argumentative speaking and writing, they were all asked to participate in a debate, as well as to write an argumentative essay, during pre- and post-intervention sessions. Moreover, participants’ previous knowledge about the topic, their stance toward the issue, their reasoning skills and their beliefs and experiences about argumentation and writing were also collected through five questionnaires and subsequently analyzed. Findings and empirical implications will be discussed.

Formative Assessments and Teacher Learning: Comparing between Three Formative Assessment Programs

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The goal of this study is to investigate the impact of three different approaches for formative teacher assessment on the development of teachers’ practical knowledge with regard to fostering vocational students’ reflection skills. The three approaches differed in the extent to which the approach was: (a) teacher-directed versus trainer-directed or (b) based on research-based versus practiced-based knowledge. 37 teachers participated in either an expertise-based assessment, a self-assessment and collegial feedback, or a negotiated assessment. (12 to 13 in each formative assessment approach).
We analyzed pre- and posttest scores of teacher practical knowledge based on verbal transcriptions of teachers’ responses to video vignette interviews. Univariate multilevel regression analyses were performed to investigate differences in the development of teachers’ practical knowledge between the three approaches, controlling for potential moderating effects of contextual and individual factors. The practical knowledge development of participants in the expertise-based assessment was significantly higher compared to that of participants in the self-assessment and collegial feedback approach. The amount of perceived coaching in school, as well as teachers’ intrinsic motivation, appeared to be significantly positively associated with the development of teachers’ practical knowledge.

Improving primary teachers’ attitudes towards science by attitude focussed professional development

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This paper presents the results of a theoretically informed professionalization project that was set up to improve primary teachers’ attitudes towards science, teaching science, and inquiry based methods of learning. A positive attitude of teachers towards science is of fundamental importance when stimulating science education in primary schools. However, most professional development projects for primary teachers focus mainly on classroom didactics and standard science lessons. It is questionable whether this approach results in improving teachers attitudes. This paper presents an unique professionalization project that focussed explicitly on improving teachers’ own attitudes toward science, teaching science, and inquiry based methods of learning. The effects were investigated using a pretest-posttest experimental-control group design (n = 94). Both quantitative and qualitative measures were used to assess changes in attitudes. After participating in the training course primary teachers showed significantly improved attitudes toward teaching science and significantly improved personal attitudes toward science compared to the control group (teachers that did not participate in the course). In addition, teachers’ self-reports indicated changes in perceptions of the complexity of science and in how often they use inquiry-based methods of teaching. The results from this professionalization project will be linked to the underlying theoretical model of attitude toward science and discussed in the light of stimulating primary science education.

Mentors’ Learning Conversations: From Intention to Actuality

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While studies have shown that mentoring is central to the development of new teachers, fewer investigations have examined what mentors learn about themselves, about their intentions and about mentoring through this role. In a two-year research project, which included a professional development intervention, we address these concerns. Specifically, we set out to analyse the dialogical goals established by 13 mentors and the conversations between these mentors and their
mentees along with mentor self-evaluations and interview data. Three questions framed the study: (a) how do mentors intend to conduct their mentoring conversations with mentees? (b) How do conversations compare to the intended goals of mentors? (c) How do professional development opportunities reflect in mentoring practice? Outcomes indicated: professional growth was evidenced but varied among mentors; and a difference existed between the planned goals and actual content of mentors’ conversations. While professional development appeared to benefit mentors, shifting mentoring to match intentions with practice was by no means simple or assured. The complexity associated with actualising goals has implications for future research and mentoring policy and practice.

**Teacher’s networked learning competencies explored using Social Network Analysis**

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Aim The goal of this study was to disentangle the relationship between individuals’ demographic characteristics, networked learning competences and attitudes and their centrality in informal learning networks in the workplace. Methodology 23 teachers were interviewed to collect data about their learning networks and their demographic background. Professional’s network positions was explored by using Social Network Analysis. To study networked learning competencies and attitudes, 12 questions were extracted from a survey (filled out by 19 of the teachers) based on the Community of Practice (CoP) theory posed by Wenger (1998). Analyses We performed non-parametric correlation analyses with the centrality measures and the responses on the extracted questions as variables and parametric correlation analyses with the centrality measures and number of external contacts as variables. Results Significant correlations were found for teacher’s flexible attitude and openness towards other people’s practices and opinions and centrality in an informal learning network. The study also indicates that teachers who have more relations with teachers that have influential positions within the network, have more knowledge of who can make use of the gains. Further we found that teachers who are eager to improve themselves professionally, gain a central position in a learning network. Lastly we found that teachers with a lot of external contacts are seen by there colleagues as valuable learning sources.

**An empirical typology of student teachers and its relation with motivation for teaching**

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Grounded in a comprehensive and integrative framework (FIT-Choice theory) this paper is a response to the need for more theory-based research on student teachers’ motivations for teaching. An important contribution to previous research is that the present study is among the first to apply a typological approach. Using a two-step cluster procedure with double-split cross-validation, evidence was obtained for five profiles of students (N = 715) at the outset of teacher education, based on their planned effort in teacher education and planned entry in the teaching profession: (1) highly engaged
persisters (high planned effort and high planned entry), (2) highly engaged switchers (high planned effort, average planned entry), (3) lower engaged persisters (average planned effort, high planned entry), (4) low engaged switchers (low planned effort, low planned entry), and (5) disengaged desisters (very low planned effort, very low planned entry). Results of MANOVA revealed an overall effect of cluster membership on motivations for teaching with a medium-to-large effect size. Univariate ANOVAs revealed a relation of cluster membership with almost all motivation factors. Effect sizes ranged from .02 to .34. Between-cluster differences in each of the motivation factors were further examined using Tukey HSD tests. This study adds to research on teacher motivation since it offers evidence that there are empirically identifiable types among student teachers at the outset of teacher education, based on their professional engagement. Moreover, these different types of student teachers show varying motivations for teaching.

**Instructional support for vicarious learning in teacher education**

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The professional competency of teachers is inseparably part of their ability to plan, understand and analyse classroom situations. Therefore, a certain level of knowledge about concepts, principles, models, and theories is mandatory. The ability to apply abstract conceptual knowledge onto concrete phenomena is a central prerequisite for professional teaching. To acquire this professional competency, teacher students need opportunities to train the application of conceptual knowledge to authentic classroom situations. Vicarious learning might be one way to enable teacher students to train the application of conceptual knowledge to a given classroom situation before they have to teach on their own. Studies have shown that vicarious learners (who are supported by additional instruction that facilitates active observation) can acquire skills to a similar extent than they would in a learning-by-doing context. However, instructional support can sometimes lead to negative self-evaluations of learning outcomes. Against this background, we examined how instructional support that requires learners to elaborate on their observations of classroom interactions in the context of physical education affects subjective and objective knowledge acquisition. Forty undergraduate primary school teacher students (95% female) participated in this study. Results of this study show that vicarious learning in the context of teacher education can be substantially improved by providing additional instruction that supports learners to apply their conceptual knowledge during observations of classroom interactions.

**Using Web 2.0 in a Preservice Teacher Education Science Methods Course**

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Understanding of the nature of science (NOS) as a crucial educational component of scientific literacy is well argued in literature and is reflected globally in science education documents and reform initiatives. Effective means to develop preservice teachers’ understanding of NOS warrants ongoing research. Students enrolled in the one-year programme of the Graduate Diploma in Teaching (Primary) at a leading University are required to take a semester-long science methods course. Almost without exception students enter this course with very limited understanding of NOS. The conceptual change required is therefore significant, and the time frame is short. This study examined the effectiveness of using a Web 2.0 application, Piazza, during and after lectures, to manage this tension and provide multiple opportunities for the learning required to effect conceptual change of NOS understanding. Data were collected using: open-ended questionnaires; selected items from the VOSTS questionnaire (Aikenhead & Ryan, 1992); VNOS C (Lederman, 2002); the students’ regular reflections; their submissions on Piazza; and assignment and test data. Analysis of the data showed a considerable shift in students’ expressed NOS views. This provokes consideration of how Web 2.0 technology could be applied to the learning spaces of universities and schools, and in areas much broader than NOS.

Theorizing in practice - Effects of case-based learning on theory articulation in teacher education

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Theory-based perception and interpretation of complex pedagogical phenomena are seen as highly important for professional classroom actions (c.f. Meier, 2006; Neuweg, 2007). However, studies provide alarming findings regarding teacher students’ competences in this field (Stark, 2005; Stark et al., 2010). In the project ‘Theorizing in practice’ at Saarland university, we developed a case based learning environment aiming at fostering these competences during university teacher education. Following a pilot study in 2010 (Klein et al., 2011; 2012) we tested the effectiveness of two learning conditions (problem based learning (PBL) vs. learning from instructional errors (LIE)) in an quasi-experimental field study. Effects on scientific argumentation knowledge and quality of theory articulation (Ohlsson, 1992) were assessed. Results showed that both conditions improve theory application in near and far transfer. In correspondence with our hypotheses, different aspects of theory articulation were fostered. Students learning from instructional errors significantly outperformed both the control and PBL group in an error identification task (negative knowledge; Oser, 2007), but were not able to avoid those errors when they had to cope with a theory articulation task on their own. On the other hand, students in the PBL condition were superior in theory articulation (positive knowledge, Oser, ibid), but showed difficulties in the error identification task. A follow-up study in the oncoming winter semester will investigate the type and amount of instructional support learners in the LIE condition need to improve their positive knowledge, since they were evidently unable to infer error avoidance strategies from instructional errors alone.

Developing Science Teachers’ Professional Vision

Miray Tekkumru Kisa
What does a science teacher see in her classroom while implementing cognitively challenging science tasks? This study focuses on developing science teachers’ professional vision in line with the recent science education policies that call for creating environments that encourage students to learn science by engaging in the practices of the discipline. We designed and implemented a video-based professional development (VbPD) and examined the extent to which five biology teachers’ ability to notice important features of classroom interactions during the implementation of cognitively challenging science tasks changed as a result of their participation in the VbPD. The main data source consists of baseline and exit interviews with each participant teacher. During the interviews, teachers viewed two classroom-based video-clips about osmosis and genetics and were asked to identify and discuss what they noticed. Preliminary analyses of the interviews suggest that there were changes in teachers’ selective attention and their knowledge-based reasoning. After participating in the VbPD, teachers started to notice the specifics of students’ ideas, scientific practices that students engaged in and how teachers’ behaviors influenced the way students were developing the understanding of biology ideas.

Assessing teacher knowledge with video vignettes: Teachers’ Classroom Management Expertise

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Classroom management is a central dimension of teaching quality and a professional task teachers have to master. For this teachers need expertise (pedagogical knowledge and performance). In this presentation we outline how Classroom Management Expertise (CME) of teachers can be measured by using video-vignettes. To do this, we conceptualize the knowledge-based reasoning of classroom situations across three cognitive dimensions: accuracy of noticing, holistic noticing, and justification of action. These dimensions are operationalized into prototypical test-items of a video-vignette. A sample (n = 108) of pre-service teachers (first and second phase of teacher education) and in-service teachers recruited from around Cologne, Germany, is used to allow expert-novice-comparisons and to empirically investigate CME. According to our assumptions, findings show in-service teachers outperform pre-service teachers of the second, practical phase, and they in turn outperform pre-service teachers of the first, universitarian phase of teacher education when looking at how accurate and how holistic they notice the presented classroom situation. Findings are discussed and related to research on teacher expertise.

Assessing teacher knowledge with video vignettes: issues related to facets of general pedagogy

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Patricia Klein
Teacher knowledge consists of cognitive elements one of which is general pedagogical knowledge (GPK). Whereas pre-service teachers usually have difficulties in transferring their declarative knowledge to the specific classroom situation, expert teachers’ procedural knowledge is of situated nature and closely related to typical sequences of teaching. The paper empirically investigates the question how and to what extent the GPK of in-service teachers with 3 years teaching experience or less can be understood as a premise for their noticing and knowledge-based reasoning of classroom management situations presented via video-vignettes. Data from TEDS-M conducted in 2008 and its follow-up TEDS-FU carried out in Germany in 2012 is used. The presentation shows findings from (1) longitudinal analysis based a paper-and-pencil GPK test, (2) qualitative analysis of open-response items related to the video-vignettes, and (3) relational analysis between declarative knowledge and the performance of in-service teachers on specific video-vignette test items. Longitudinal analysis shows GPK is highly auto-correlated. There are qualitative differences in the responses derived from open end items given in the video-vignette assessment. Such responses will be sorted into two components: noticing and knowledge-based reasoning of classroom management situations. Whereas noticing does not substantially correlate with the GPK test, the knowledge-based reasoning component does. Results are discussed in the context of research on teacher expertise.

Assessing teacher knowledge with video vignettes: Rating scales as an instrument for video-analysis

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The TEDS-FU-project, a follow up study of the Teacher Education and Development Study, aims to analyse the competence development of mathematics teachers at the end of their professional education and the first years of work experience. Different kinds of test components have been developed, amongst others a video analysis in order to assess more practical and situational facets of teachers’ professional competences. As part of teachers’ competencies, observational, analytical and alternative proceeding skills are assessed by video analyses in the longitudinal study TEDS-FU. As an assessment instrument rating scales allow to evaluate teachers’ competencies to analyse and judge classroom situations and behaviour. The paper describes the process of an expert rating aiming to secure reliable scales. It is pointed out that there exist several distracting elements in the rating process such as the length of the assessed video sequence. Items that focus on limited scenes reach a greater expert agreement than those necessitating information retrieval from the entire video clip. Furthermore, expert ratings on items referring to psychological constructs such as intrinsic motivation do not reach sufficient consensus.

Fostering learning in a scientific community through access to community knowledge

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Researchers are required to learn constantly about developments, new approaches, and findings within their scientific community and conferences and workshops can support researchers in this learning process. But to what extent do researchers actually benefit from such events? It seems likely that researchers with lower levels of knowledge about the scientific community benefit less than more experienced members who have participated to a greater extent in the scientific community. In this study we investigated from a social network perspective and for a particular conference, the influence of community knowledge support, level of community participation, and communication activities on this learning process. Participants of a conference filled in a social network questionnaire and their communication activities were tracked with RFID devices. We found that the likelihood for a possible relation between conference participants to turn into a collaboration is smaller for peripheral members than for members who participate more actively in the scientific community, but that the likelihood increases with time spent interacting with others. Another result is that peripheral members actually benefit less from conference participation in general, except if they are supported through access to community knowledge. These findings agree with current research on communities of practice and shared cognition, while extending this research with a social network approach. It follows that the success of conferences as an event to foster researchers’ learning about the work of other participants and increase their possibilities to find new collaboration partners can be fostered by providing information about the other participants.

**The learning potential of the boundary: multi-actor learning environments for life science students**

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Authentic tasks representative for life science students’ future professional life involve multiple disciplinary perspectives and, cannot be solved without taking account of perspectives of multiple actors with diverse interests. As such, they require boundary crossing between different sociocultural sites. Dutch life sciences education, preparing students for these professional problems, aims to utilize the learning potential from boundary learning in the form of ‘regional learning environments’ (RLE). This study explores if six RLEs as practiced in educational practice contribute to students
domain specific and generic competence development, if working in multidisciplinary groups and with multiple external actors has an added value for this learning and what preconditions exist for utilising the learning potential of RLEs. Quantitative pre- and post-test student data and qualitative teacher data collected in a structured workshop are analysed using paired t-tests, multivariate GLMs, and open and axial coding. Results show a differing pattern of competence development across RLEs. Multidisciplinary RLEs more strongly foster students’ domain specific and generic competence development. Quantitative data show less effect of multi-actor collaboration while qualitative data show a wide range of potential learning outcomes typically related to multidisciplinary group work or multi-actor collaboration. It is concluded that the learning potential of RLEs as a boundary learning environment is not optimally utilised yet and results showed that process coaching aimed at explicating learning opportunities is an important precondition for increasing students’ learning.

**Written narratives about Key experiences of learning : a Chilean sample**

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In May 2012, sixty Chilean adult students from a low-income social background participated in a study focused on their key experiences of learning (KEL). This paper focuses in the characteristics of the KEL reconstructed by these learners through written interviews. We have used a theoretical model for Learner Identity (LI) construction as our theoretical framework to analyze the relationships between KEL and Learner Identity, especially focusing on the emotions and the motives as described by the subjects. The results highlight the role of the connections that subjects make between their learning experiences in how they recognize themselves as learners.

**Describing and understanding hybrid learning in Higher Education**

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For more than 20 years, techniques and methods of distance education have been introduced and fostered in Higher Education, mainly through the use of virtual learning environments (such as Moodle, Claroline, Blackboard, etc.). One of the outcomes of this change has been the development of hybrid or blended learning. Up to now, research has largely focused on user satisfaction or case analysis. No clear theoretical framework has been established to capture the complexity of such learning systems. In addition, there has been no description of the variety of courses developed with a view to evaluating the efficiency of the pedagogical scenarios employed. This paper intends to present and discuss the main results of an ambitious three-year mixed-method European research project (HY-SUP). HY-SUP provides theoretical, methodological and empirical answers to three major questions: What are the characteristics of hybrid courses developed in Higher Education? Are specific scenarios more effective in terms of their effects on the quality of student learning and on teacher professional development? And what are the socio-organizational factors that could encourage the development of such hybrid learning practices in HE institutions?

The influence of perceived peer participation on learners’ commenting activity

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The study presented deals with the influence of perceived peer participation on learners’ activity in writing comments during task processing. Forty students took part in the study. They worked with a computer-based learning environment on ‘Mental disorders in adolescents’. After each of the forty content pages the participants had the possibility of commenting on the pages. A within design was implemented varying the comments already written by others (10 x without, 10 x 1 comment, 10 x 2 comments, 10 x 3 comments). Additionally learners’ attitude towards writing comments and their prior domain knowledge was assessed. Results show that perceived peer activity positively influences writing activity. However, the amount of already stated comments did not make a difference. Learners’ attitudes towards the comment function and as well their prior domain knowledge successfully predicted writing activity.

The Importance of Perceived Usefulness and Integration on Ninth-grade Students’ Digital Competence

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The ability to use information and communication technology (ICT) is an important competence in our society. The aim of this paper was to examine the importance of perceived usefulness and integration of information on ninth graders’ digital competence. A sample of 729 ninth-grade Norwegian students from 49 schools participated in a study on perceived usefulness, integration of information and frequency of use of ICT at school. Additionally, the students were asked to complete a digital competence quiz. Multilevel analysis was employed to scrutinise the influence of these factors. The preliminary findings from the analysis revealed that increased levels of perceived usefulness, integration and family background are related to increased levels of digital competence. The implications of these findings were: 1) to detect how students interpret and represent the information they receive, and 2) to emphasise if students consider that technology can enhance their learning.

Tool use in blended learning: The role of social-cognitive based individual differences

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This empirical study investigates students’ learning choices for mathematics and statistics in a blended learning environment, composed of both online and face-to-face learning components. The students (N=2461) were university freshmen with a strong diversity in prior schooling and a wide range of proficiency in quantitative subjects. In this context, we investigated the impact that individual difference constructs have on how students self-regulate their learning, in terms of the intensity of using the online learning mode versus the face-to-face mode, that is based on small group, problem-based learning. A social-cognitive framework of learning, incorporating implicit theories, effort beliefs, goal orientations, and motivation and engagement is applied to specify antecedents of learning regulation within the blended learning environment, and that serve the role of distinguishing different learner profiles. Using structural equation modelling of both self-report and system tracking data, we find that less adaptive students, in terms of students scoring high on impeding cognitions, turn out to be intensive e-learners. However, these less adaptive students do not profit to the full extent from their high learning efforts in the CBLE.

Behaviour problem or emotion disorder? Emotion reactivity and regulation in the middle school years

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According to epidemiological studies, between 6 and 14% of 7-year olds exhibit moderate to clinically significant emotional and behavioural problems. Such problems interfere with learning, contribute to teacher burnout, undermine development of peer and teacher relationships and predict future social and academic difficulties. Clinical research employing an emotion regulation perspective is typically concerned with the relationship between emotion regulation and symptoms associated with externalising psychological disorders such as attention deficit, hyperactivity, oppositional defiance and conduct problems. Emotion regulation theory does not well explain such externalizing problems and a central goal for this study is to link physiological reactivity and regulatory behaviours to the timing and manifestations of such maladaptive regulatory processes in order to enhance the assessment of emotional and conduct problems in school. One hundred participants (age 7 to 9) from UK primary schools were observed during two collaborative LEGO construction tasks, generating high involvement, challenge and requiring communication, problem-solving, creativity and joint attention. Physiological measures of electrodermal activity were combined with observations of adaptive/maladaptive emotion regulatory strategies, self-report and teacher-report questionnaires. Preliminary results findings from clinical samples suggesting that hyperactive/inattention males with maladaptive regulatory tendencies experience higher levels of physiological reactivity and lower physiological reactivity for reported conduct problems. The findings for females are less conclusive, demonstrating substantial inter-individuality and raising questions for future research and teaching practice. Interpretation of findings reveal the risk and protective factors for emotion disorders at an age that is useful for identifying children with difficulties who would benefit from targeted intervention.

Motivational and achievement-oriented predictors of alienation from school

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School alienation is characterized by a lack of identification with school and a gradual process of students emotional distraction from scholastic goals. It can lead to school dropout, however, there are also those students who do not attract special attention because they function as learners on a surface level yet without feeling attached to school (Hascher & Hagenauer 2011). Individual as well as contextual factors contribute to the development of school alienation. Thus, there is the need to investigate on a multilevel approach which factors are of relevance to students alienation from school. The current study aimed at gaining a deeper insight into predictors of school alienation and identifying determinants during early adolescence. 916 students with a mean age of 11.3 (SD=0.44) from grade 5 to 8 participated in a cross-sectional design. They attended two close-by types of lower cycle schools in rural areas differentiated by their achievement levels. The results confirm the prevalence for male secondary school students (b=.81) as well as the predictive value of motivational regulation (b=-.73), parents highest educational qualification (b=-.77) and students achievement in Maths, English and German (b=.64), but the size of the association varied due to the different type of school. As school alienation occurs among all investigated students, prospective prevention and intervention strategies should not be restricted to the male subgroup. Although the study provides
new findings about the predictors of school alienation, further research is needed to take the additional role of students, teachers, peers, siblings, and parents into account.

The construction of students’ national identities through argumentative practices in classroom

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This paper concerns the role of argumentation in classroom discussions about national identification. More specifically, we examine students’ representations of identity conflicts and their connections with romantic conceptions attributing essentialist features to nations. Although national identities are a controversial issue, few studies have examined how they are constructed through argumentative practices and how they involve emotional dimensions. The aims of our study are to analyse the components of national identity that students use in their arguments, and to examine the mechanisms of discursive construction in a situation of socio-cognitive conflict. The case-study proposed here concerns the participants in a group of Spanish students (grade 11) discussing the issue of identity conflicts in Northern Ireland within history classes. The argumentative and discursive analyses focus on the discourse of one student who had a minority position in her small group. Two main results will be highlighted: a) the concept of nation used by a majority of students is defined by the ‘territory’; b) students refer to two sets of statements in order to articulate their arguments: an endoxon about democratic values and a pseudo-endoxon grounded in social representations about nations that may contradict the endoxon. The findings underline that the different students’ positions are situated in a continuum going from civic justifications of national identities to historical justifications.

Emotions in intercultural education: a tension between individual and collective dimensions

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Some years ago, civic education related to cultural diversity took a new turn. Instead of providing information about different cultures, ‘intercultural education’ addressed complex social issues, in particular the relation to otherness, and gave much room to the students’ social identity, personal experience and emotions. From a psychosocial standpoint, this shift raises new questions: Which social knowledge and practices are transformed into school subject matters? How are the students’ personal experience and emotions considered? For which purpose? With what consequence? Assuming, with Vygotsky, that learning implies the learners re-contextualising their everyday experience on a conceptual plane, we carried out a research project aiming at studying the transformation of the student’s emotions and personal experience in intercultural education: are
they recontextualised on a level that goes beyond immediate experience? With what difficulties? Our analysis of interactions recorded in 12 classrooms in Swiss primary and secondary schools revealed the various ways in which the teachers dealt with emotions, namely emotions as expression, emotion as a link to introduce factual information and emotion as an object of study. Analysing teacher-students discourse also showed that there was a tension between emotions conceived of either as a personal and unique experience, or as a collective experience that can be shared, but negates the uniqueness of individual experience.

A cross-national perspective on teacher resilience

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The aim of this symposium is to argue the relevance of teacher resilience for responsible teaching, and for sustained learning by reflecting relevant research from four countries (Australia, the United Kingdom, South Africa and Ireland). As in many other countries there are concerns in these four countries over the retention of teachers, particularly in the first years of their career, in the light of financial investment as well as potential future shortfalls. Recent research (Beltman, Mansfield & Price, 2011) has indicated that pre-service courses can assist in developing the capacity for resilience in new teachers. Assets have been identified which contribute to ‘bouncing back’ from adversity in order to establish their contribution to beginning teachers’ (first year of teaching) efforts to cope with negative events at school (Morgan, 2011). Resilient teachers are able to rebound from setbacks and adversity and show sustained effort and perseverance even in the face of difficulties (Gu & Day, 2007). Rather than being seen as an innate quality, resilience is seen as ‘relative, developmental and dynamic, manifesting itself as a result of a dynamic process within a given context’ (p. 1305). Certain contexts present significant challenges to teachers as they work with children and families in emerging economies (Ebersohn, 2012). This symposium aims to present research findings exploring current conceptualisations of teacher resilience, and how teacher resilience can be shaped and supported in different contexts.

Developing Capacity for Teacher Resilience

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The field of teacher resilience has emerged as an important area for research, particularly in countries where the teaching profession is subject to high rates of attrition and teacher burnout. Developing the capacity for resilience in pre-service teachers may enable them to continue and to thrive in the profession, despite its challenges. Many factors influencing teacher resilience have been
identified in the literature and much has been written about protective and risk factors, both within teachers and the in contexts in which they work. Despite many studies focusing on teacher resilience, there have been fewer studies exploring how resilience may be developed through teacher education experiences. This paper reports findings from the project Keeping Cool: Building Teacher Resilience which aimed to investigate graduating and early career teacher resilience to develop a framework for how aspects of resilience may be embedded in teacher education programs. Using data from an extensive literature review, surveys, and interviews, four dimensions of the resilient teacher were identified. Each of these dimensions (profession-related, emotional, motivational and social) is discussed with a specific focus on the potential for teacher education. Furthermore, as resilience is a complex and multi-faceted construct, the important role of teacher education programs in the development of teacher resilience for the future is explored.

Adding ‘Flock’ to ‘Fight and Flight’: A relational perspective on teacher resilience

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How do teachers continue to provide responsible teaching to learners who are anxious because of orphanhood, tired and hungry because of poverty, ill because of AIDS? Why do teachers continue to show up for work when they have not been paid for months, classrooms are derelict, textbooks are not delivered? How do teachers sustain learning when parents (as partners in learning) are unemployed and illiterate? In this presentation I explain how, in a resource-constrained education system, solidarity can support well-being. In this education-ecology teachers use relationships as a way to access and mobilize resources to counter adversity. Teachers actively reconfigure passive, desperate school environments into enabling/supportive school climates that foster learning and development. I propose Relationship-Resourced Resilience (RRR) as a generative theory to explain how resilience occurs when teachers act as a collective, rather than engaging in individual and subjective processes to cope with multiple long-term risk factors. I draw on nine years of long-term Participatory Reflection and Action (PRA) data from a partnership study with South African partnership schools (n=12, primary=9, secondary=3; urban=9, rural=3, provinces=3) and teachers (n=74, female=63, male=11). The RRR-model posits that, when under threat of chronic stress in resource-constrained settings, teachers demonstrated resilience (and enabled resilience) as a collective response: ‘flock’/‘flocking’ (rather than fight or flight). Flock entails a process of alone-standing teachers appraising persistent burdens as shared, and connecting with each other (and school-community networks) to access, share, mobilise and use available resources in order to continue in their roles as teachers.

The Role of Resilience in Teachers’ Career Long Commitment and Effectiveness

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To teach, and to teach at one’s best over time, has always required resilience and commitment. To date, however, there has been little research which has investigated the ways in which teachers’ capacity to be resilient and committed may be nurtured, sustained or eroded over time as they experience different conditions in their work and lives. Drawing upon findings of a four-year national research project on variations in the work and lives of teachers in England, this paper provides empirical evidence which contributes to understandings about the importance of resilience in teachers’ work and effectiveness. The experience of resilience as perceived by teachers in this research was that it was neither innate nor stable and was much more than a capacity to survive and thrive in extremely adverse circumstances. Rather, it was perceived as being closely allied to their
everyday capacity to sustain their educational purposes and successfully manage the unavoidable uncertainties which are inherent in the practice of being a teacher. Their capacity to be resilient fluctuated as a result of the influences of the personal, relational and organisational settings in which they worked. The relationships between teachers’ sense of resilience, commitment and effectiveness (both perceived and measured by pupil attainment and progress) are explored in such a context. The findings have implications for initial and in-service professional development programmes, school leadership and the quality retention of teachers.

Beginning Teachers’ Resilience

Mark Morgans
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Ireland

The burgeoning literature on ‘resilience’ and especially the paradigmatic change guiding the research has important implications for understanding the experience of adverse events at work. Based on an overview of the relevant literature in developmental, social and clinical psychology, three main assets contributing to ‘bouncing back’ from adversity are identified in order to establish their contribution to beginning teachers’ (first year of teaching) efforts to cope with negative events at school. Specifically, the present study sought to examine how these assets (strengths, social support and coping skills) that have been found to facilitate resilience in extant research, translate to the experiences of teachers’ methods of recovering from adverse events (Study 1) and to gauge the relative contribution of these assets in facilitating the ability to recover from adversity (Study 2).

Results indicate that the assets that a beginning teacher brings to the encounters have a powerful influence on recovery from negative happenings. Furthermore, these resilience-facilitating factors do not predict general Teacher Efficacy, indicating that resilience can be thought of as a separate construct. The conclusion seems warranted that the assets model has important implications for understanding interventions that address the capacity to recover from setbacks including those occurring at work as well as in childhood.

Understanding educational practice through attending aspects of teaching, learning and materiality

Airi Rovio-Johansson
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Sweden

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Finland

Educational research that endeavours to influence and support good practice face the challenge to investigate the most important aspects of the whole learning situation in such a way that the understanding of each aspect is compatible with the others and the whole. Further, the unfolding understanding must be theoretically founded in such a way that it may be channelled in meaningful
ways towards supporting the decisions taken in educational practice. Availability of such theoretical
commensurability (and interest) is rare. This symposium reflects an exploration of such relationships
on the basis of phenomenography and variation theory in the context of higher education. The
simultaneous attention to teaching and learning presupposes that contextual features are taken into
account theoretically. Channelling the research in meaningful ways in relation to existing practice is
dependent on building interrelationships between research focus and practice, and developing the
competence to simultaneously keep attending to a specific issue in research while at the same time
recognising the compromises necessary in negotiating the practice. Always present, the materiality
of teaching comes into focus in some practice, and the integration of teaching, learning and
 technological structure is pivotal for the development of learning. Integrating an understanding of
materiality towards an understanding of teaching and learning becomes essential.

Towards an integration of research on teaching and learning

Lennart Svensson
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Sweden

A challenge to all educational research is to integrate descriptions of teacher and student parts of
education. These main parts of educational phenomena have to a large extent been studied
separately, as different fields of research. The teacher part has been dealt with within research on
teaching and curriculum development. The student part has been dealt with within educational
psychology as field of research. During the late 1960ies the divide was paid attention to and a
remedy was suggested called ATI (Aptitude-Treatment-Interaction). The idea was to integrate
characteristics of student activity and teacher activity to understand educational phenomena. The
variable based measurement approach used put limitations on the attempt. Since then a variation of
forms of qualitative inquiry into education has been developed. One approach and tradition of such
research is called Phenomenography and Variation Theory research. Phenomenography and
Variation theory research has produced knowledge about some different central and critical aspects
of learning and teaching. The common focus in the Phenomenography and Variation theory research
is on describing critical aspects of and differences in understanding subject matter. Phenomenography research has mainly focused on student learning, and Variation theory research has, in the form of Learning lesson studies, focused on teacher presentation of subject matter. The
time has come for a more complete study of teacher and student activity in relation. The common
focus on critical aspects of the dealing with and understanding of subject matter forms a good basis
for an integrative description of teaching and learning.

Using Phenomenography and Variation Theory Pragmatically

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Anna Eckerdal
Uppsala University
Sweden

Arnold Pears
Uppsala University
Sweden

Neena Thota
University of Saint Joseph
The Uppsala Computing Education Research Group, (UpCERG), Uppsala University, Sweden does research on students’ learning of computer science and engineering in higher education. UpCERG tackles research questions of teaching and learning with a pragmatic approach, closely connected to the needs of the students and teachers. The group plays a leading role in advocating rigorous research methods and takes its methodological point of departure in phenomenography. As the research questions are often complex in themselves and also are integrated in a multi-faceted context, methodological frameworks have been developed to extend the traditional phenomenographic analysis. The scope of the research projects is wide. It ranges from gaining insights into unexplored areas within students’ learning of computer science, to deploying variation theory to reveal the complex relationship between the students’ learning of the theoretical aspects of computer science and their practical knowledge in applying these concepts. Other projects explore how the cultural aspects of students’ learning of computer science are intertwined with their understanding of computer science as such. The practicalities of developing the principles for a research based phenomenographic course design are also dealt with. In summary, this presentation documents the continuing involvement of UpCERG in the development of the phenomenographic movement. By tying phenomenographic theory, methodology, pedagogy, and practice we extend the work of the subject area based phenomenographic environment to the life of phenomenography itself.

What matters? Learning in the laboratory as a material-discursive-practice

Jonte Bernhard
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According to Variation theory one necessary condition for learning is that students are able to focus on the object of learning and discern its critical features. In modern society the production of knowledge in science and engineering is technologically embodied. This is more than to say that science uses instruments (technologies), but it uses these technologies in unique and critical ways. As a result learners’ and professionals’ experience of our world in should not be seen as a direct experience human, world, but as an experience shaped by the use of physical and symbolic tools, i.e. artefacts. The concept of mediation and mediating tools could be represented diagrammatically as: Human, mediating tools (artefacts), world. I.e. the world is seen through instruments and experimental devices (mediating tools). However, this is often neglected and instruments and devices are often thought of as having no cognitive value per se. On the contrary I argue that technologies, and hence materiality, can not be neglected since they shape our experience by placing some aspects of reality in the foreground, others in the background, and makes certain aspects visible that would otherwise be invisible. In my study I show that different technologies used in laboratories indeed have different affordances for discernment and variation and hence materiality (i.e. matter) matter (sic!) for learning. Hence students’ learning need to be investigated as a material-discursive-practice.

Collaborative learning in physics group discussions: A phenomenographic perspective

Ake Ingerman
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Sweden
This presentation attends to an educational space in between the teacher’s teaching and the individual learning, that of small group discussions where individual and collective agency in relation to merged aspects of learning and teaching physics meet. Based on an empirical investigation of seven one-hour small group problem solving sessions in the context of a mechanics course at university, I make use of the analytical sharpness in describing what is learned that has been the hallmark of the phenomenography and variation theory research tradition. In the analysis I attend to sequences in the video and audio recorded events where the same object of learning, one of the key features of Newtonian mechanics relevant in relation to the specific task discussed, is focused in the discussion. The different discussions develop in qualitatively different ways, even when similar critical aspects are brought into the discussion: In one end there are groups which discuss them separately, but do not put them in relation to each other, they move in circles. In the other end there are groups that attend to several aspects simultaneously, their discussion progresses in terms of complexity of how the situation is portrayed with Newtonian mechanics. The latter is understood as exemplifying collaborative learning on the group level, where learning is bound to the situation and to how the key features of Newtonian mechanics are discerned by the group as a collective.

Making connections between Neuroscience and Education

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Bert De Smedt
University of Leuven
Belgium

Layne Kalbfleisch
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United States

The aim of this SIG-Invited Symposium is to provide EARLI participants with an overview of current areas of research where a cognitive neuroscience approach is used to address research questions in the field of learning and instruction. The symposium consists of four empirical studies that cover various instructional domains, including reading, mathematics, working memory, and reasoning. All studies combine behavioural and neuroscientific methods. Collectively, these studies will illustrate different connections between cognitive neuroscience and educational research. These include (a) How neuroimaging data can help to predict the emergence of specific difficulties in reading, such as dyslexia (b) The effects of behavioural interventions based on neuroimaging data, such as working memory training and teaching of appropriate solution strategies in reasoning (c) The effects of brain stimulation on academic achievement, i.e. mathematics learning. All empirical papers will address the theoretical and educational implications of their findings and will illustrate how neuroscience and education can interact to address questions relevant to learning and instruction. The discussant will end the symposium by highlighting common issues in research at the crossroads of neuroscience and education as well as a critical discussion on how the presented studies may or may not contribute to educational research and practice.

Development of the reading network in children with high-risk on dyslexia

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KU Leuven
Belgium
Reading acquisition starts with the awareness that graphemes correspond to phonemes. To achieve stable grapheme-phoneme correspondences, explicit and well specified representations of phonemes and graphemes must develop. In developmental dyslexia, phonological processing skills are clearly impaired, even before reading acquisition, and it is therefore generally accepted that the reading and writing problems in dyslexia are caused by a deficit in the development and the use of phonological representations. However, little is known about the neural development of the reading system, especially in relation to dyslexia. Diffusion Tensor Imaging, indicating structural connectivity, and Resting-state fMRI, indicating functional connectivity, have both been proved to be good methods to investigate the reading network and have direct relevance for the understanding of dyslexia. In the current study, a longitudinal design including children at risk for dyslexia, has been set up in order to unravel cause and consequence of a lifelong reading impairment. Within this presentation we will present the results of the first (pre-reading) wave of this study and compare these with data of adult readers.

**Limitations and chances of working memory (WM) training: Impact on performance and neural efficiency**

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ETH Zurich
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Michael Schneider
University of Trier
Germany

Roland H. Grabner
Georg-August-University of Gottingen
Germany

Elsbeth Stern
ETH Zurich - Institute for Behavioral Sciences
Switzerland
Recent studies show controversial results on the trainability of WM capacity as a limiting factor of human cognition. We investigated whether participants improve performance in trained and untrained tasks as a result of WM training. By means of electroencephalography (EEG) we additionally investigate if potential behavioral changes are reflected in changed general cognitive activity patterns. Ninety young adults trained over a two week period (7.5 hours total) in one of the following conditions: an adaptive WM task with increasing difficulty, a non-adaptive WM tasks with constant moderate demands, and a control reaction time task. All three groups where presented with the same WM, mathematical or intelligence transfer tasks before and after training when also their brain activity was measured. WM training had positive effects on trained tasks as well as on untrained tasks with a similar surface structure. Tasks that differed in various characteristics showed no WM transfer gains depending on the three experimental groups. In the EEG results, an increase in neural efficiency was seen after training. In light of these findings, limitations and chances of WM trainings are discussed.

Overcoming intuitive interference: Brain studies (fMRI & tDCS) point to an educational intervention

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Reuven Babai
Tel Aviv University
Israel

Overcoming intuitive interference in mathematics education is a key pedagogical challenge. Here we focus on the comparison-of-perimeter task, known to elicit intuitive incorrect responses. Children intuit that geometrical shapes with larger areas have larger perimeters. In congruent trials (correct response matches intuition: larger area-larger perimeter), accuracy was higher and reaction time was shorter than in incongruent (counterintuitive) trials. An fMRI study revealed that different brain areas were activated when responding in accordance with intuition or when overcoming it. Correctly answering incongruent trials activated bilateral prefrontal brain areas. A preliminary tDCS experiment suggested that stimulation of the right prefrontal cortex increased accuracy of responses in the incongruent trials. These studies indicate that the prefrontal cortex is involved in overcoming intuitive interference. This brain area has been reported to be associated with executive control, possibly activating inhibitory control mechanisms and appropriate solution strategies. We further explored whether increasing the efficiency of appropriate solution strategies would improve school children’s performance in incongruent trials. Presenting the shapes discretely rather than continuously might encourage appropriate solution strategies, such as counting or moving segments. Children completed two comparison-of-perimeter tests (discrete and continuous). In the incongruent trials, success in the discrete test was higher than in the continuous one. Moreover, success in the continuous test increased when it followed the discrete one. This intervention points to the possibility that selection of proper presentation mode may enhance students’ choice of appropriate solution strategies and thus their ability to overcome intuitive interference in mathematics.

Effects of brain stimulation on arithmetic problem solving and oscillatory EEG activity

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Tobias Hauser
University of Zurich
Research has shown that smaller arithmetic problems (3 + 4) are predominantly solved by retrieving the answer from memory and larger problems (29 + 14) by applying procedures (e.g. counting, transformation). Although there is recent evidence suggesting that brain stimulation might lead to beneficial effects in solving larger problems, not much is known about the effects of brain stimulation on the performance in smaller problems or on the induced changes in the underlying oscillatory activity of the electroencephalogram (EEG). In the present study, twenty-six participants underwent anodal (30 min, 1.5 mA, applied over the left posterior parietal cortex) and sham transcranial direct current stimulation (tDCS) at two sessions. EEG was recorded while the participants solved small and large arithmetic problems. We examined the effect of tDCS on arithmetic problem solving (solution rate and response latency) and the event-related synchronization and desynchronization (ERS/ERD) in the theta, lower alpha and upper alpha frequency bands. Statistical analysis revealed that in large problems response latency was decreased, whereas lower alpha ERD was increased after anodal compared to sham stimulation. In small problems, a decreased solution rate accompanied by a decreased (predominantly left-hemispheric) theta ERS after anodal compared to sham stimulation was found. These results suggest that anodal tDCS modulates the performance in school-relevant arithmetic problem solving in a problem-specific way and that corresponding changes in the oscillatory activity in the EEG can be observed. Therefore, tDCS in combination with EEG constitutes a promising tool to study the neuronal basis of mathematical skills.

Methodological Diversity in Investigating Workplace Learning

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Germany

Workplace learning is an intriguing field of research that is approached from many different angles to better understand the development of vocational expertise and ways of supporting it. The community of Sig 14 Learning and Professional Development represents researchers with a high variety in scientific disciplines and theoretical paradigms with their methodological diversity (such as phenomenology, ethnography, empirical research). This diversity has led to lively discussions in the SIG. The speakers in this symposium took up the challenge to investigate workplace learning and they dealt with the complexity of doing research in real-life settings. What does it mean to investigate work as site for learning, what important factors influence learning and need to be measured, and what kind of instruments are used? To capture the complexity of workplace learning different levels have to be considered such as the individual, the team, and the work organisation.
this symposium, the presenters represent different research paradigms and they will illustrate strengths and weaknesses of their research. Experts will critically discuss the state of the art and opportunities for future research.

**A Design Perspective on Workplace Learning: Planning Learning Trajectories**

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Maastricht University  
Netherlands

The main aim of the reported research is to develop guidelines for organising workplace learning in such a way that both the learning of domain-specific skills and self-directed learning skills are promoted. In order to reach this goal, learners must work on professional tasks that show sufficient variability of practice, gradually increase in complexity, and show a decrease in available support and guidance. Moreover, they must learn to self-assess performance, identify points of improvement, and select future tasks that are suitable to work on these points of improvement. Thus, learners should not only develop professional skills but also sustainable self-directed learning skills that enable them to continue learning throughout their career. This presentation discusses findings from a series of studies investigating how electronic development portfolios can help learners and their coaches to assess learning from previous tasks and select optimal future tasks for learning. The studies concern the role of coaching, the formulation of assessment criteria, and self-coaching protocols. The overall finding is that development portfolios may help to develop both professional and self-directed learning skills. Coaching, however, is critical and the responsibility over the planning of future learning activities should gradually move from the coach to the learner. The main theoretical and educational finding is that the focus in workplace learning should not be on performance but on learning, that is, on progress or lack of progress over tasks. Only then, it is possible to promote both the development of professional skills and self-directed learning skills.

**Promoting Professional Agency: Methodic Challenges of Intervention Research**

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Katja Vahasantanen  
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This paper aims to contribute to the discussion on methodic challenges of intervention research. We address the challenges deriving from a multilevel intervention programme which aims to promote professional agency in education and health care work. In the PROAGENT research project we have double purposes: i) to develop an intervention programme, and through the implementation of such a programme, ii) to investigate the nature and manifestations of professional agency at work. Our theoretical background can be characterised as a subject-centred socio-cultural approach. We understand professional agency to be practiced as professional subjects and/or communities exert
influence, make choices, and take stances in ways that affect their work and/or their professional identities. The intervention programme consists of: i) identity coaching workshops, ii) a manager workshop to support agency-promoting leadership, and iii) a dialogical work conference aiming to increase participatory and democratic dialogue at the organisational level, and iv) intermediate spaces for creating couplings between these. The programme is implemented in five different organisational contexts (two central hospital emergency wards, two university departments, and one administrative service centre). Data is collected through a multi-method approach. Our findings and preliminary experiences in the interventions suggest nine critical aspects that enhance the methodic quality and credibility of the intervention research.

Where is ‘Work’ in Workplace Learning Research?

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In this presentation, I will explore the extent to which, in researching workplace learning, we situate our inquiry in the work itself and discuss the methodological and ethical implications of doing so. Drawing on case study research, I will argue that workplace learning is an interdisciplinary and dynamic phenomenon and, hence, needs to be investigated through a set of interdisciplinary lenses. I will also argue that by drawing attention to the ‘work’ aspect of workplace learning, we can examine our understanding(s) of the sustainability of learning and to what extent it is dependent upon the sustainability of work.

Methodological Pitfalls and Opportunities in Investigating Workplace Learning

Sven De Maeyer
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One of the key characteristics of the field of workplace learning is that it almost always implies doing research at the workplace and as a consequence it makes use of real-life situations and contexts to set out the research. Moreover, workplace learning is not an individual isolated issue. It implies the complex interplay between variables at both the individual as well as the organisational level, which can be multi-layered at its turn as well. Therefore, research on workplace learning can be at least labelled as challenging but most of all as methodologically ‘tricky’. This presentation will be on the methodological pitfalls and opportunities that can be identified when setting out quantitative research on workplace learning. The presentation aims at triggering the discussion during the symposium. I will start by outlining a framework on quantitative research in general, based on the approach of Kane (2006) on validity. This framework will incorporate methodological choices such as ‘relevant observation units’, ‘sampling’, ‘operationalization’, ‘research goals’, ‘research design’ and ‘statistical techniques’. Then I will situate the challenges raised and/or discussed in the previous papers on workplace learning within this framework and identify pitfalls and opportunities for research.

Large-scale Interventions of Executive Functioning in Kindergarten and Primary School Children

Claudia Roebers
University of Bern
Switzerland

Claudia Roebers
University of Bern
Given that executive functions and sub-dimensions thereof (such as updating, inhibition, and cognitive flexibility) are consistently found to be a substantial predictor of young children’s school readiness and their early academic achievement (especially in mathematics), efforts have been made aiming at fostering EF in young children (kindergarten to primary school grades). In the planned symposium, four different large scale interventions and their evaluations realized in three different countries will be presented. All interventions target sub-dimensions of executive functions, and all studies include kindergarten and/or primary school children. At the same time, the interventions differ in terms of the kind of training (computerized, adaptive training versus small group interventions) and the EF sub-dimension targeted (updating, inhibition, visual-spatial short-term memory) allowing a thorough discussion about factor influencing the effectiveness of EF intervention programmes. The question of near and far training effects will be addressed by all contributors, an important practical but also theoretical issue. And finally, differential training and transfer effects will be discussed in all four contributions to the symposium as the existing empirical evidence point to differential training effects depending on children’s age, their prior skills, and the intensity of training.

**Fostering executive functions in small group interventions: Training and transfer effects**

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psychology 
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Claudia Roebers
University of Bern 
Switzerland

Executive functions (EF) are related to different aspects of child development, including school readiness and early academic achievement. Improving EF might therefore represent an important scientific purpose. Previous studies have shown that EF, especially working memory, can be promoted through training, even at an early age. However, less is known about EF trainings targeting inhibition and cognitive flexibility, and it is still debated to what extent fostering EF may yield far transfer effects to children's early academic skills. In the present study, ninety-two kindergarten children were assigned to three different groups: two intervention groups (EG 1: inhibition, EG 2: cognitive flexibility) and an active control group (CG). The intervention programmes were carried out three times a week during one hour over five weeks. Preliminary pre-and post-test analysis revealed that kindergarten children significantly improved their cognitive flexibility and that the cognitive flexibility intervention group, but not the inhibition group, showed larger improvements over time compared to the active control group. No training effects were found for children in the inhibition group. For the children in the interventions groups, small transfer effects on early math skills were detectable, especially in younger children. Collectively, these results indicate that EF can be trained in preschool children. The present study suggests that EF dimension differ in how easily they can be improved by training and that short-time interventions do have rather small transfer effects on academic skills.

**Improving working memory in children: A comparison of two intervention programmes**

Kerry Lee
In recent years, many studies have investigated the efficacy of working memory training programmes in children and adults. Intervention programmes targeting the updating component of executive function have found improved performance not only on tasks similar to those used in the programmes (i.e., near transfer effects), but also performance on non-trained tasks (i.e., far transfer effects). Updating refers to children’s abilities to retain, refresh, and operate on information in their immediate memory and has been shown to be highly correlated with measures of working memory capacity (Miyake et al., 2000). Some studies have also found that the commercially available Cogmed also produces both near and far transfer effects on working memory and related performance measures (e.g., Thorell, et al., 2009). These studies tested the efficacy of a suite of updating intervention games based on the Running Span and Keep Track paradigms and compared it to that of Cogmed. Because our previous findings suggest that updating explains a larger proportion of individual differences in mathematics than does working memory, we expected our intervention programme to equal if not outperform Cogmed in efficacy. Participants were 119 7-year-olds with mathematical difficulties enrolled in a learning support programme. They attended 20, 25 sessions of either programme, 3, 5 days a week. Preliminary results suggest that both intervention programmes produce near transfer effects. Findings also suggest that children with different abilities benefit from the updating programme differently.

Training effects of working memory in the Math Garden and generalizations to mathematics

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Han L.J. van der Maas
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Netherlands

Brenda Jansen
University of Amsterdam
Working memory is a strong predictor of academic performance, meaning that it is a potentially powerful target for intervention studies. Improving children’s working memory may boost their performance in various other domains. Nevertheless, a recent meta-analysis showed that results are moderate: there are few sustained effects months after the training, and generalization of the training effect to other cognitive domains is small. Sustaining the training seems therefore important. Moreover, samples are usually small. To investigate the effectiveness of a training that is available for a large group of children for a longer period of time, we developed the Mole Game, as a part of Math Garden. Children aged 6 to 12 years log in and enter their garden with plants. Each plant gives access to a math game, with adaptive exercises. We included the Mole Game, a visuospatial working memory game, in Math Garden. We investigated the development of 4753 children that regularly played the Mole Game. Repeated Measures ANOVAs showed a significant improvement in the Mole Game after four months of play. This was significantly related to improvement in various mathematical domains. The improvement followed a dose-response relationship: the more Mole Game items children had played, the greater their improvement in both the Mole Game and the math games.

On the Improvement of Executive Function and School Readiness in Preschoolers

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Zhao Ming Tony Lim
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Kerry Lee
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This study aimed to examine whether executive function (EF) and school readiness (SR) in preschoolers can be improved via a group-based integrative EF intervention program. Singaporean 4- to 5-year-olds participated in this study, which lasted for about half a year. A 3 (condition: intervention and free-play) X 2 (tests: pre-intervention and immediately after the intervention) mixed design was used. Four EF tasks, including Auditory Working Memory, Delay of Gratification Choice Version, Flexible Item Selection Task (FIST), and Planning, and four SR tasks from Woodcock-Johnson III Tests of Achievement, including Sound Awareness, Picture Vocabulary, Quantitative Concept, and Applied Problem were administrated. Preliminary analysis with 44 children revealed that working memory, flexibility, planning, sound awareness, vocabulary, and the ability to solve applied
mathematics problems increased during this half year. Additionally, the results indicated that the intervention program improved children’s flexibility and understanding of quantitative concepts.

**Symposium: What can interventions tell us about sustainable learning of mathematics?**

Ruth Vanderswalmen  
University College Arteveldehogeschool  
Belgium

Annemie Desoete  
Ghent University & Artevelde University College  
Belgium

Pirjo Aunio  
University of Helsinki  
Finland

Practitioners generally report mathematic difficulties in children from elementary school onwards. This symposium will focus on interventions to enhance early numeracy and mathematics and critically analyze and compare those interventions to detect the core components of sustainable learning of mathematics. Pretest-intervention-posttest designs with a control group were used in all papers. The effect individualized non-intensive interventions in mathematics, focusing on the particular components with which an individual child has difficulty were studied in paper 1. Moreover it is studied whether fostering number sense is more efficient through a symbolic (counting) or a mapping (number line) training programme in kindergarten (paper 2). In addition the effects of a two short computerized interventions in kindergarten were compared to the spontaneous evolution of age matched control children (paper 3). Finally the effect of a holistic program on Self-regulated learning embedded in the math material in grade 5 was studied (paper 4). The question will be asked whether standardized (paper 4) or individualized (paper 1,3) interventions using games (paper 2) or computerized exercises (paper 3) can enhance early numeracy (study 1,2,3) and mathematic performances (study 1,3,4) in children, and if so, which of the interventions is the most effective. The scientific and educational relevance of the findings will be discussed.

**Targeted interventions for children with mathematical difficulties**

Ann Dowker  
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United Kingdom

Difficulties with numeracy are common. Given the varied nature of mathematical difficulties, it is important to devise and use individualized and targeted interventions for children with such difficulties. This talk will refer to several such interventions, and will focus in particular on the relatively non-intensive, Catch Up Numeracy intervention, which was developed by the speaker in collaboration with Catch-UpR, a not-for-profit British educational charity. Catch Up Numeracy, a targeted component-based intervention developed to support the needs of these children, which is delivered by teaching assistants in two fifteen-minute individual sessions per week. Analyses of data for 550 children including controls show that children receiving Catch Up Numeracy intervention achieved average Mathematics Age gains of more than twice that expected of typically achieving learners, and more than twice that achieved by children receiving other mathematics support. The evidence suggests that Catch Up Numeracy is effective for children who are low attaining in mathematics. More generally, it strongly supports the view that children’s arithmetical difficulties are highly susceptible to intervention, and that the amount of individualized intervention does not need to be large to be effective.
Number sense training in kindergarten: a comparison between a counting and a numberline training

Ilona Friso-van den Bos
Utrecht University
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Children’s early numerical capacities have been suggested to form the building blocks for later proficiency in mathematics. Both the conceptual linear mental representation of numbers and the procedural counting skills have been suggested to be of vital importance to mathematics development. The current study aims to investigate whether fostering number sense is more efficient through a symbolic (counting) or a mapping (number line) training programme. 90 kindergartners took part in a training study with 3 conditions: a counting condition, a number line condition, and a control group. Pretests and posttests included number sense tasks (number comparison, number lines, counting, and number naming), and an addition test. Results showed a marginally significant effect of training condition on the posttest scores of counting, and significant effects on the posttest scores of addition and symbolic number lines. In all cases, the counting intervention group gained more than the control group (all ps

Can computerized kindergarten interventions enhance sustainable learning of mathematics?

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Studies have reported large individual differences among children before the onset of formal education (e.g., Aunio, Hautamäki, Sajaniemi, & VanLuit, 2009). Previous longitudinal studies also showed that early numeracy skills are accurate predictors of later mathematics achievement (e.g., Desoete, Ceulemans, De Weerdt, & Pieters, 2010). In this study we aim to study the impact of two individualized computerized interventions designed to enhance early numeracy skills by focusing on particular components with which an individual child had difficulties. The interventions took place, prior to and at the beginning of formal schooling. The study had a
randomized control design. The effects of a 9 session computerized counting and a comparison intervention in kindergarten during five weeks, 25 minutes each time were compared to the spontaneous evolution of age matched control children (n = 61). Children in both the number comparison or counting group in kindergarten performed better than children in the control group on mental aritmetics and number knowledge six months later (in grade 1). No significant differences were found between the counting and comparison computer-based interventions. Both non-intensive interventions allowed educators to provide appropriate effective and sustained support for early numeracy learning.

Does an Affective Self-regulation Program Have an Added Value in Mathematics?

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The research examined the added value of an affective self-regulation component included in an holistic SRL program providing multi-focus meta-cognitive and motivational-emotional training. The holistic program was compared to a single-focus self-regulation program (meta-cognitive / motivational-emotional). A control group was used which received no self-regulation training. The effect of the intervention on SRL was examined by measuring young students’ meta-cognition, motivation-emotion, and mathematical literacy in the context of problem-solving tasks. 238 fifth graders from four schools were randomly assigned to four groups: a holistic SRL group, a meta-cognitive training group, a motivational-emotional training group, and a control group . The SRL components and math literacy (PISA, 2003) were examined using mixed methods (self-report and real-time): (a) SRL: learner’s pre/post self-report measures; (b) real-time thinking aloud protocols, and (c) self-judgment scales measuring metacognitive / motivational-emotional awareness; math literacy tasks with various complex tasks and transfer levels that were administered during intervention and three months afterwards (long-term transfer). The holistic SRL program proved itself more efficient than the other three groups in the SRL measures and the mathematical transfer tasks of different levels; whereas the motivational-emotional program reduced their negative emotions towards mathematics to a greater extent. The control group demonstrated least overall efficiency in the SRL and mathematics tasks. The theoretical and practical implications of the programs will be discussed at the symposium.

Interactions supporting interplays between dialogical learning and dialogical self

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Educational contexts have an extremely interactive nature. Interactions can engage many agents: teachers, students, parents, and various tools and objects and can elicit different modes of thinking, reasoning, and of being. The quality of interaction plays a relevant role in the interplay between dialogical learning and dialogical self. Each of the four papers composing this symposium examines a particular type of interaction, looking at the impact on the identity development. Paper 1 is based on the concept of learning to think as a dialogue that takes into account the perspective of different types of others. Paper 2 focuses on thinking as part of the cognitive and social students’ development. A revisitation of the piagetian critical interview method is offered. Paper 3 looks at how a highly interactive blended course enhances students I/We positioning as learners. Paper 4 defines the ‘Educational’ self and its dialogical features as emerging during teacher-parents encounters. All these contributions consider dialogicality as essential for sustainable education. Being able to improve the dialogical quality of students identity means to provide an answer to the demands put forward by the contemporary society.

Some dialogic mechanisms at work when children learn to think

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This theory paper outlines three specific dialogic mechanisms involved when children learn to think and illustrates these mechanisms with examples drawn from classroom studies of teaching thinking in China and the UK. The account of these dialogic mechanisms is embedded in a dialogic theory of teaching and learning thinking which focuses on developments in identity and relationships. The broad proposal for a dialogic theory of how children learn to think is presented through unpacking the conceptual implications of three key concepts: ‘dialogue’, ‘thinking’ and ‘learning’ in order develop the argument that learning to think could be understood, at least partly, as a shift towards identification with dialogue itself rather than with more static images of the self. This theory is applied to the analysis of six short episodes of classroom interaction divided into three pairs each of which illustrates the role of a different kind of dialogic relationship in learning to think: a) taking into account the perspective of a specific other; b) a culturally defined virtual other; c) taking the perspective of the ‘infinite other’ or trying to see as if from the outside. It is argued that the relationship with a real or imagined other helps to take the thinking of individual children forward. This exposition of key dialogic mechanisms in learning to think is significant as a potential contribution to theory underlying a responsible practice of teaching for sustainable learning.

Self and other in piagetian interviews

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In his early work, Piaget created a mean to study cognitive development in children’s thinking: the clinical-critical interview. Since the very beginning, Piaget was conscious of the conversational difficulties to access children’s thinking. Making counter-suggestions did not entirely resolve the problem, because children interpreted them in a different way than what the adult is intending. Our aim here is to examine if the study of reprises could be a useful mean to observe how children take their place in the conversation and if and when they take an I-position. Thereby we contribute to examine the dialogical dimension of the clinical-critical interviews. The study is based on a corpus of videos of conversations between adults and children around the piagetian test of conservation of quantities of liquid. Our analysis of the results makes clear that piagetian interviews are not only soliciting cognitive activity of the children but engage their self images and their understanding of their own status as thinkers. Beyond the case of these piagetian interviews, our findings raise questions about the methodological and theoretical problems encountered in interviewing children.

**Development of dialogical self in a highly interactive blended course**

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This paper refers to identity as a change process of the structure of higher mental functions. The idea that a person has to be understood by looking at his/her entirety leads this contribution and embraces the perspective of sustainable learning as a tool to support the development of such wholeness. To grasp the dynamicity of identity and the social dimension of psychological development, we combine CHT with Dialogical Self (DST) Theory. Therefore, we look at the Self as a set of multiple and polyphonic I-positions related to space-time contextual dimensions. To study the development of I and We-positioning of university students participating in a highly interactive blended course, we arranged with them two focus group discussions, one at the start of the course and one at the end of the course. We analyzed the transcripts of the focus groups through dialogical qualitative content analysis by looking at the use of: (a) own voice; (b) others’ voices; (c) space-time of learning (chronotopes). Results show that the dialogical structure of the Self enriches during the participation in the course by building new I and We-positions as critical, self-determined, and collaborative students. However, such new positions seem to be related to the specific context of the blended course and, rather than being transferable to other learning experiences, they seem to connect the university context to future jobs.

**Dialogical features of the Educational Self**

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In this contribution we argue for the efficacy of the ‘Educational Self’ concept to understand some relevant aspects of the learning-teaching processes from a psychosocial point of view. In an empirical and theoretical perspective, we assume that Educational Self could be considered a part of the Self devoted to the management of specific socio-cognitive activities in everyday life. According to our previous works, Educational Self emerges in dialogical interactions every time the person is involved in an educational system of activities (as student, parent or teacher) during his/her lifetime. In the present contribution, excerpts of parents-teachers interactions (audio-taped during school-family meetings) will be analysed to highlight some feature of the Educational Self emerging in that context. According to our results, we are persuaded this notion.

Grade comparability in exit exams on upper secondary level in three European countries

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In several European countries, the comparability of upper secondary exit exam grades is of major concern. The points of criticism are based on empirical results which show that there are significant differences between schools and classes as well as between school subjects in defining and maintaining standards. Particularly in countries where the results of the upper secondary exit exams are highly relevant for students’ further career, it is absolutely essential to improve the grading system to avoid injustice. However, there is a lack of empirical results which help to explore in detail the problems of the grading process and to analyze the impact of strategies to improve the grading system on upper secondary education. Therefore, the aim of this symposium is to shed light on grading systems in three different countries and to discuss the consequences of different strategies to improve the grading process. Whereas in the first paper Kupiainen et al. describe the relationship between students’ exam choice and grades in the matriculation exams in Finland, Maag Merki et al. investigate the effects of the implementation of state-based exit exams on grading in Germany. In the third paper, Marjanen et al. test the applicability of statistical methods as one solution to improve grade comparability in Finland. In the last paper, Bramley (UK) examines the consequences of using an alternative method for setting grade boundaries.

Upper Secondary Exit Exams – Is Choice Compatible with Commensurability? The Case of Finland

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Exit exams for upper secondary education have a longer history than high stakes tests for lower grades, due to their role in access to higher education. National exit-exams differ, however, regarding the share of students taking the exam, the exam’s form and content, its organisation and implementation, and its educational function. The Finnish matriculation exam, the only high stakes exam Finnish students face during their school careers, largely complies with Bishop’s (1998) view of a ‘good’ curriculum-based external exam. However, since the adaptation of the comprehensive school in the 1970s, reforms to accommodate the growing heterogeneity of the upper secondary student population through increased course and exam choice, the Gaussian grading of subject specific exams has begun to compromise the comparability of the grades, with higher achieving students competing for grades in the more demanding subjects while the lower achieving students share the same distribution of good and weak grades in the less demanding subjects. This can have ominous repercussions for both students and universities when the grades are used in selecting students to tertiary education. Based on a data of 131,000 matriculating students from 2006 to 2009, the consequences of the incommensurability of the grades will be studied at student and school level, also taking into consideration the gendered subject choices. Preliminary analyses show considerable differences between schools in the exams taken, rendering school-level comparisons hard to interpret, and undermining the prospects of students from high-profile schools at university entry.

Do state-wide exit exams increase the comparability of grades in Bremen?

State-wide exit exams are seen as one method to increase the comparability of grades and have therefore been implemented in almost all German states. Research indicated a standardizing effect showing that state-wide exam grades have a higher level of comparability than grades in class-based exams. However, these results are only based on cross section data and not on longitudinal section data. In this contribution the question whether state-wide exit exams do increase the comparability of grades in written exams will be analyzed concerning the German state of Bremen. Our assumption is that the higher level of standardization of the exit exams increases the comparability of the grades in the written exam in advanced math, in a short and a longer term. The data is based on a longitudinal study (2007 - 2011) focusing the implementation of state-wide exit exams at the end of upper secondary education in the German state of Bremen. We conducted three different analyses.
regarding both individual and school level. The results show that the implementation of state-wide exit exams seems to affect the comparability of grading rather on school level than on individual level. Further, the results show the importance of distinguishing between school and individual level. In order to increase the comparability of grades, additional development strategies of school improvement are required and theoretically postulated.

**Statistical methods for comparability of subject difficulty: Case of the Finnish matriculation exams**

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Exit exams for upper secondary schools are common in most European countries. In some, including Finland, examination results are used to grant entry points to students applying for tertiary education. This can be problematic since the comparability of grades between different subjects and exams can be questionable. In Finland this is largely a consequence of students’ vast freedom of exam choice as well as norm-referencing of grades. In literature statistical methods have been suggested as one possible solution to improve grade comparability. However, these methods have been criticized for example over method and sub-group invariance as well as the assumption of grade unidimensionality. (Coe et al. 2008.) In this paper the statistical methods and their criticism is assessed in the light of the Finnish matriculation examination data from years 2006-2009. It appears that at least the subgroup invariance and unidimensionality critique is more or less justified in the Finnish case.

**Maintaining standards in public examinations: why it is impossible to please everyone**

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Major reforms are currently planned for both the main high-stakes academic qualifications taken at schools in England, the GCSE (taken at age 16) and the A level (taken at age 18). The main reason for the reforms has been concern about the ‘fitness for purpose’ of these examinations, concern that has been fuelled by several high-profile crises. This paper shows how the increasing number of possible routes to the final grade in a subject that has arisen in the system in England over time has led to increased complexity in the mechanisms that are used to maintain standards, and the consequent undermining of confidence in the system when these mechanisms produce outcomes that are perceived to be unacceptable. The consequences of using a naïve or simplistic alternative method for setting grade boundaries (cut-scores), namely setting them at fixed points on the raw mark scale of the assessment components, are explored in order to highlight the tensions
between transparency, fairness, defensibility and logical coherence in evolving an examination system that meets the needs and expectations of its stakeholders.

**Mind the gap! Studies on the development of the rational number concept. Part II: Improvement**

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Many authors have argued that number sense develops very gradually and to a large extent implicitly. This symposium focuses on one case where research identified a gap in this gradual development: the transition from natural numbers to rational numbers. Research in cognitive-developmental psychology and mathematics education has repeatedly shown that a major source of difficulty in the learning of rational numbers is the interference of natural number reasoning, a phenomenon that is also denoted ‘natural number bias’. Students implicitly or explicitly assume that the ‘behaviour’ of natural numbers also applies to rational numbers, which leads to systematic errors. Some of these errors diminish with age and level of instruction, whereas others are remarkably persistent. In mathematics education, the gap between natural and rational numbers is hardly dealt with explicitly, and a long term perspective on the development of the rational number concept in order to bridge this gap is rarely taken. Contributions to the symposium summarize research conducted on various utterances of the ‘natural number bias’, using a wide variety of tasks and methodologies, and involving diverse age groups. This is the second part of a symposium consisting of two parts. Part I provided studies that analysed the interference of natural number knowledge in various tasks and age groups, pointing towards potential explanations. Papers in Part II will focus on pathways for improvement, by analyzing the way rational numbers are introduced in textbooks, searching for predictors of individual differences in rational number understanding, and analyzing the effects of educational interventions.

**The transition from natural to rational numbers in mathematics textbooks**

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Rational numbers are among the most difficult topics of the mathematics curriculum in elementary school (Ni & Zhou, 2005). A main cause for students’ difficulties with rational numbers is the discrepancy between some features of (operations with) rational numbers and students’ prior knowledge about natural numbers (Vamvakoussi et al., 2012). Learning rational numbers requires a ‘conceptual change’ (Vosniadou & Verschaffel, 2004), given that there is a conflict between students’ deeply rooted prior knowledge about natural numbers and the newly taught conceptualization about rational numbers. If instruction wants to be effective, students have to experience that their prior knowledge is incompatible with the rational number system (Ni & Zhou, 2005). A main source on which teachers rely in their instruction is the mathematics textbook. This contribution documents on an analysis of three elementary school mathematics textbooks. The textbook analysis focused on four aspects in which there are discrepancies between natural and rational numbers, i.e., (1) the size of rational numbers, (2) operations with rational numbers, (3) the density of rational numbers, and (4) representations of rational numbers (Vamvakoussi et al., 2012). For each of these four aspects it was investigated whether differences or similarities between natural and rational numbers were implicitly or explicitly emphasized. The results revealed that analogies between natural and rational numbers were exploited to the detriment of fundamental discrepancies between both number domains.

Spontaneous focusing on quantitative relations and the development of rational number knowledge

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The present study investigates the role of Spontaneous Focusing On quantitative Relations (SFOR) in the development of rational number conceptual knowledge of primary school children. It is well documented that the transition from learning and using conceptual knowledge of natural numbers to concepts of rational numbers is a key stumbling block in mathematical development (Van Dooren et al., 2010; Vamvakoussi & Vosniadou, 2004). It is proposed that those children with a higher SFOR tendency may experience an easier transition from dealing with concepts of natural numbers to concepts of rational numbers. A longitudinal study of SFOR tendency in 10-12 year olds (N=263) measured participants’ SFOR tendency and the development of conceptual knowledge of rational numbers. SFOR tendency was measured using open-ended, non-explicitly mathematical tasks, in which there were multiple aspects upon which students could focus, including quantitative relations. Results reveal that SFOR tendency is a unique contributor to the development of rational number knowledge, beyond prior rational number knowledge, non-verbal intelligence, and arithmetical skills. A high SFOR tendency predicts a significantly larger increase in conceptual knowledge about rational numbers, in particular concepts of the density of rational numbers. It is proposed that SFOR tendency may contribute to an increase in self-initiated practice with rational and decimal numbers.
Measuring misconceptions: Revealing the nature of changing decimal fraction knowledge

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Misconceptions are common in many mathematics domains and can be barriers for learning. Consequently, it is important to have good measures of misconceptions as a part of assessing students’ learning. We developed three measures of decimal misconceptions: a) prevalence of different types of misconception errors, b) confidence in their responses, and c) endorsement of misconception-based strategies using a ‘hidden decimal task.’ We assessed the decimal knowledge of U.S. students (N=342) in Grades 4 and 5 before and after a two-day intervention. During the intervention, students studied worked examples and answered questions with a partner in their math classrooms. Overall, students’ knowledge increased moderately after the intervention. This was partially due to a slight decrease in frequency of misconception errors from pretest to posttest. However, errors made with high confidence (i.e., strongly held misconceptions) did not change much after the intervention, while errors made with low confidence (i.e., weakly held misconceptions) decreased. Also, the ‘hidden decimal task’ indicated that misconceptions may be more common than indicated by students’ answers on other decimal problems at both pretest and posttest. Consequently, providing additional measures of students’ misconceptions can create a more complete picture of students’ knowledge prior to and after a lesson, and should be used to inform instruction.

Developing students’ reasoning with rational numbers

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In this paper we analyse students’ understanding of rational numbers, especially in tasks involving order and comparison, seeking to understand the reasoning processes involved in relation to different representations (informal and formal). The study is made in the context of a teaching unit following an exploratory approach, aligned with the new mathematics curriculum, which values different representations of rational numbers in different meanings, and provides insights about the possible contribution of such an approach towards students’ learning of rational numbers and reasoning with rational numbers. The methodology is qualitative, using participant observation of the work done in a grade 5 class. Data collection includes interviews, the students’ written productions in class, and video and audio records of classes and of interviews. The results show that the students improved their understanding of rational numbers and their representations, showing that they are competent and flexible in the selection of representations and strategies best suited to
each situation or problem. They also improved their understanding of ordering and comparing rational numbers, mainly using the decimal representation, in line with the work done during the teaching unit, as students were able to use many different representations. The reasoning processes of the students increasingly adopted formal representations and strategies, drawing on mathematical definitions and properties. In several cases, they were able to use formal reasoning processes directly supported in informal reasoning processes, suggesting that the teaching unit promoted a positive connection between these two kinds of processes.

Social presence revisited: fostering sustainable online learning

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The concept of social presence has been revised in the last years. The traditional definition of the concept, drawn from social psychology (Short, Williams & Christie, 1976), referred to the technical qualities of the media and has proven to be of little interest by itself when it comes to fostering learning in online environments. Research shows that the key element does not lie in the technical device per se, but rather in the use of the devices that participants negotiate and perform during the activity. This symposium presents a quartet of studies that put social presence under revision in order to expand our understanding of it in different ways: in its delimitation from other concepts, such as social space (study 1); in its potential as a teaching instrument to develop long distance blended courses in an intercultural context, in order to promote cognitive engagement (study 2); in its application to learning using social media as something different from the discussion forums it was initially proposed for (study 3); and finally, in its potential to understand students’ learning behavior both in small group and big group collaborative activities (study 4). Some of these studies are currently in process (studies 1 and 2); therefore the presentation of results at this proposal moment is only preliminary. The authors’ high expectations of challenging results advance a rich discussion of ideas that will allow us to move forward in the comprehension of quality criteria for online teaching, including its sustainability through the co-responsibility of learners and instructors in the promotion of social presence.

Exploring the Assessment of Social Presence and Social Space in a Community of Inquiry

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Many scholars researching collaborative learning in computer supported environments have recognized social presence as an important variable that co-determines the degree of social interaction amongst the group members and their satisfaction with online learning. Social presence is commonly seen as a single construct but some scholars recently argued that, in line with Short, Williams, Christie’s (1976) original definition of social presence, the construct actually represents two constructs, namely ‘social presence’ as the psychological phenomenon by which the other is perceived as ‘real’ in the communication and ‘social space’ as the representation of the network of interpersonal relationships. Social presence in the Community of Inquiry (CoI) framework of Garrison, Anderson, and Archer (2000, 2010), as many other frameworks, too, integrates both constructs whilst emphasizing social space. Therefore, we have extended this framework in order to show this distinction. In the current study we present two instruments that were developed for the purpose of operationalizing both constructs. Moreover, an empirical exploration is performed of the discriminant validity of social presence and social space. Finally, structural relationships between the two constructs and a third variable, namely sociability, are tested. It is expected that sociability, or the degree to which an online environment enables to project oneself into this virtual community, will be a direct antecedent of social presence and an indirect antecedent to social space. To test our conjectures, two CoI groups will be studied; the first group used the Blackboard environment and the second group Facebook.

**Blended redesign for collaboration: social presence and cognitive engagement in a research seminar**

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This study examines how social presence and cognitive engagement are created and supported in a fully redesigned collaborative research seminar that involves two simultaneous teaching sites and two communities of graduate students from a Hungarian (n = 10) and a US university (n = 15). The course is run from September until December 2012. In particular, we aim to investigate whether social presence contributes to students’ cognitive engagement. We also address the questions whether the blended-learning course redesign and instructor approach provide adequate scaffolding to nurture the development of social presence. Course redesign procedures were documented and analyzed by an independent researcher. Transcripts of asynchronous online interactions are analysed by two independent coders by using the CoI framework (Garrison, Anderson, & Archer, 2001). Transmitted real-time class sessions are observed by two observers using an observation protocol adapted from the coding scheme for social presence and for cognitive engagement. Additionally, we survey student ratings of the degree to which social and cognitive presence were manifest in the course. We assume that blended-learning course redesign based on the CoI framework (course structure, pragmatic and functional ways of instruction, scaffolding etc.) can influence the creation of
socially active communities and that social presence and cognitive engagement are related in a sustained, multi-directional communication that exceeds low-level cognition. We intend to discuss the limitations of the applied research tools and suggest further research methodologies applicable in similar collaborative academic initiatives.

Social Presence: Informal On-task Interactions in learner-driven online environments?

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Social presence in a community of inquiry in prior research has been characterized as social off-task interactions that depict learners as real people. This research presents an open-ended approach to the analysis of social presence in an online learner-driven environment where participants (n=18) belonged to an online doctoral program. The results revealed an overwhelming number of informal on-task conversations related to the subject-matter of the program compared to strictly social conversations. We conclude that that social presence cannot be isolated from cognitive presence or subject-matter when participants in an online environment share common learning goals. Social presence has to be redefined in learner-driven online environments and when newer technologies and social media are used.

Social presence in small v. big group collaborative e-learning: does size make a difference?

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Social presence has been recently redefined as the result of a dynamic construction of participants in their learning interaction (authors, in press). Social presence promotes the creation of a community feeling, the maintenance of positive relational dynamics, and the enhancement of self-efficacy in front of the learning task, so that the learning process is supported. Up to now, the revised concept had been tested in small group collaborative learning situations. In this study, we analyze one single group of students (n=15) performing two different kinds if activities: (a) the construction of an argumentative essay, in small groups of four students each; (b) the debate of an educational conceptual issue, in an open debate group with instructor assigned positions (n=7 versus n=8). The results of the interpretative content analysis permit the identification of variations among these different activities, on the one side. On the other, it proofs the validity of the categories for understanding social presence in different kinds of instructional contexts. Instructional decisions can be informed by the conclusions of this study so that the individual’s engagement on pursuing the shared learning goals is supported.

Self-regulated learning in kindergartners and primary school children

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Self-regulated learning is a key component of students’ sustainable learning. Previous studies have shown that the beginnings of self-regulated learning can be traced back to the preschool and primary school years. The symposium aims at broadening our understanding of self-regulated learning in young children, its dependency from individual and environmental conditions and its significance for learning outcomes. Based on different contexts and research methods, the common goal of the studies presented here was to show that research and educational practice benefit from paying attention to self-regulated learning even in kindergarten and primary school. One study compares the self-regulated learning abilities of typically developing children in kindergarten with those at risk for learning disabilities. The second paper deals with effects of the instructional context on self-regulated learning. In this study first graders benefited from the implementation of a combined training program consisting of a math specific and a more general self-regulation intervention. The third paper shows the effects of a tutoring program, in which university students were included, on promoting key elements of self-regulated learning in fifth and sixth graders. The forth study investigates the relationship between self-regulated learning and academic achievement in regular primary school science classes. In third classes, results show that teachers’ metacognitive strategy instruction can provide particular support to students with less prior knowledge. In summary, the papers may provide empirical support to the individual and environmental conditions of fostering self-regulated and sustainable learning in young children. These issues will be discussed in detail subsequent to the presentations.

Self-regulated learning among kindergarteners at risk for learning

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Despite the vast number of studies conducted among school children and adults, the literature about young children’s Self Regulated Learning (SRL) is in its infancy. Investigation of SRL among different age groups having diverging learning capacities, including young children at risk for learning disabilities (ALD), is still needed. In this spirit, the purpose of the current study was to examining development of SRL among ALD in comparison to typically developing (TD) kindergarteners. The sample consisted of 84 children aged 5-6, 42 ALD and 42 TD children. The participants were recruited from kindergartens in the center of Israel; the ALD participants were selected on the basis of inclusion criteria (NJCLD, 2007). All children were first tested on verbal and non-verbal intelligence tests. The children were then videotaped while building a train track according to pictures printed on
cards. Their behavior was later assessed with the Whitebread et al. (2010) observation tool for assessing young children’s SRL. In addition, validation of the results was conducted by asking the children’s teachers to complete a questionnaire (Whitebread et al., 2010) evaluating young children’s independent learning development (emotional, social, cognitive and motivational skills). The findings indicate that TD children had greater SRL abilities when compared with ALD children, expressed by their behaviour observed on-line during the train track-building task and the answers obtained from the teachers’ questionnaire. Implications will be discussed in the symposium.

Classroom-based promotion of self-regulation and quantity-number competencies in primary school

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The present study based upon findings of a preliminary investigation that indicated an increase of first graders’ performance in basic arithmetic and self-regulated learning by the implementation of a combined training program consisting of a math-specific (MZZ) and a self-regulation (SRL) intervention. In order to replicate these results and to investigate the specific effects with regard to the order the combined training program is conducted the intervention of the present study in further classes. Therefore, we acquired 485 first graders from 30 classes as participants. The classes were randomly assigned to one of three conditions: (1) combined training (SRL+QNC); (2) combined training in reverse order (QNC+SRL); and (3) control group without training. The teachers of the experimental groups were trained to implement the training contents during regular classroom settings. Before and after the intervention children’s academic performance as well as their self-regulation competencies were measured using standardized group tests. The data was analyzed with covariance analysis. Preliminary results showed a significant intervention effect for the SRL+QNC-group with regard to students’ performance in basic arithmetic as well as a significant transfer effect to basic arithmetics. In order to verify long-term effects of the intervention, analyses including a follow up measurement are conducted currently.

The challenge of promoting at-risk primary school children’s self-regulated learning

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Providing an equitable distribution of educational opportunities has become an important challenge for many educational systems. In this respect, the present study explores the effects of student tutoring as a method to provide instructional support regarding self-regulated learning (SRL) to at-risk fifth and sixth graders. 219 Flemish (Belgium) fifth and 185 sixth-grade students at-risk due to their socio-economic and/or non-native background participated in the study. 106 pupils in the experimental condition (tutees) received guidance of university student tutors during 10 successive weeks. A quasi-experimental study with a pretest, posttest, and retention test control group design was used combining self-report questionnaires with think-aloud protocol analysis. The quantitative results of the questionnaire and think-alouds reveal no significant positive effects on pupils’ self-regulatory strategy use. However, positive trends from pretest to posttest are observed regarding several key components of SRL (e.g., task analysis, planning, learning strategies). Further, the results illustrate the complexity of promoting SRL in at-risk primary school children, recommending a longer and more intensive intervention followed by continuous support of teachers.

Compensating for lacking prior knowledge through learning strategy instruction?

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Prior knowledge is closely associated with learning outcomes, which is at least partly due to differences in learning strategy use. Novice students rely strongly on cognitive strategies, without using metacognitive strategies to regulate them efficiently. Scaffolded strategy instruction is suggested to compensate for ineffective strategy use. Yet, little research has been conducted on the influence of strategy instruction on the connection between prior knowledge and learning outcomes. Therefore, we examine whether instruction of cognitive and metacognitive strategy use negatively moderates the connection between prior knowledge and learning outcomes. We assessed 573 third graders’ content knowledge and science competence, and conducted video observations of cognitive and metacognitive strategy instruction by their 36 teachers. Results of multilevel regression analyses only confirmed a negative moderation by instruction of metacognitive strategies which remained significant even when controlling for instruction of cognitive strategies. Possibly, instruction of metacognitive strategies is more effective as it supports students’ regulation of cognitive strategy use as well as that of metacognitive strategies.
Dealing with (Socio-)Scientific Controversies: Epistemic, Motivational, and Cognitive Dimensions

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The advent of new media has increased public exposure to the developing nature of scientific knowledge. One of the hallmarks of scientific knowledge is that it advances through argumentative processes in which competing theories attempt to promote their claims by grounding them in evidence. However, public understanding and interpretation of scientific debates and controversies may differ from those of scientists. Furthermore, comprehension of scientific controversies may entail not only complex skills but also epistemic understandings of how scientific knowledge is constructed and justified. The aim of this symposium is to advance the study of learners’ understandings of scientific controversies by exploring various factors that may affect the ways in which learners interpret and comprehend scientific and socio-scientific controversies. The symposium contributions examine several critical questions: How do learners’ linguistic and cultural backgrounds contribute to shaping justification beliefs regarding controversial scientific knowledge? Do learners’ motivational states affect their epistemic perceptions regarding conflicting scientific texts? What role do learners’ epistemic understandings play in evaluation and integration of competing scientific perspectives? And does critical evaluation of the plausibility of controversial knowledge claims lead to conceptual change? These conceptual and empirical investigations significantly extend our current understandings of how learners engage in the complex task of making sense of controversial knowledge claims. Furthermore, the contributions to this symposium suggest specific instructional approaches that may help promote critical comprehension and evaluation of (socio-)scientific controversies.

Epistemic Beliefs when Language-Majority and Language-Minority Students Read Conflicting Documents

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We examined the role of domain-specific justification for knowing beliefs (i.e., justification by authority, personal justification, and justification by multiple sources, respectively) in learning and comprehension when language-majority and language-minority students from the same school classes read five conflicting documents on the scientific issue of sun exposure and health. Results showed that the more the language-minority students trusted science authorities and the less they relied on personal opinions about scientific issues, the more they learned from and the better they comprehended the documents. In contrast, justification for knowing beliefs did not seem to play a role in learning and comprehension among the language-majority students. These results may be due to lower prior knowledge among the language-minority students, with justification beliefs affecting learning and comprehension processes to a greater extent when prior knowledge is not available to support such processes. However, differences in cultural values could also be a possible explanation. This study is probably the first to indicate different relationships between various justification beliefs and performance in different language and cultural groups, having theoretical as well as educational implications.

How Induced Motivational States Impact Dealing with Conflicting Scientific Information

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Our study investigates the influence of induced motivational states on different aspects of dealing with conflicting information, e.g. in how far people feel confident to decide on the controversy, in how far they think experts could do so, in how far they feel the urge to additionally ask an expert, and their information search behavior. The impact of a short instruction emphasizing that the great availability of information on the Internet creates many possibilities, e.g. allows for independent opinion making and participation in knowledge society (benefit group) was compared with the impact of an instruction emphasizing that laypeople cannot profit from information on the Internet as such information leads to confusion and disorientation (intricacy group). After that, all participants dealt with eight partly conflicting short texts on cholesterol in order to decide about a certain suggested treatment. Results revealed several differences between the two groups: For example, the intricacy group read some texts longer, felt more confident and reached higher scores in a self-concept measure than the benefit group. It also believed less that knowledge is reserved for experts and more often made a decision. That is, surprisingly the intricacy group seems to be better prepared to deal with conflicting information, probably because the fit between what they experienced during information search and what they were told before was higher than for the benefit group.

The Role of Epistemic Thinking in Comprehension of Multiple Online Socio-Scientific Perspectives

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One of the challenges of understanding socio-scientific controversies is the challenge of making sense of multiple perspectives, understanding their relations, and forming connections between source perspectives and claims. This challenge takes on additional importance in an information society in which the public is increasingly exposed to multiple competing scientific perspectives through online news and social media. The current study examines the role of learners’ epistemic thinking in their ability to identify and understand multiple socio-scientific perspectives, and to employ these perspectives in order to critically evaluate and integrate multiple online sources. The study is conducted with undergraduate participants in a convergent mixed-methods design. Quantitative data collection and analyses are used to examine the effect of epistemic perspective (absolutist, multiplist, and evaluativist) and online source perspectives (contrasting and converging blog-posts) on learners’ ability to understand, evaluate, and integrate multiple socio-scientific perspectives. Qualitative data is collected by asking learners to think aloud as they read contrasting blog-posts and is used to analyze learners’ epistemic cognition and metacognition. Preliminary results from a pilot study indicated that in the converging blog-posts condition epistemic thinking did not have a significant role, however, in the contrasting blog-posts condition, participants with high evaluativist scores were significantly more successful in comprehension and integration of multiple source perspectives. A concerning finding is that few students referred to author perspectives in their source evaluations. The findings of this study suggest that many learners who read conflicting socio-scientific information online may fail to construct an understanding of the controversy without additional epistemic support.

**Bridging the Plausibility Gap in Socio-Scientific Issues**

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Climate change is a highly relevant and gravely serious topic; in an educational setting, climate change also presents an opportunity to learn about fundamental scientific principles and how scientists construct knowledge. However, individuals may be neither naturally evaluative when learning about climate change and other controversial topics, nor reflective while engaging in judgments about knowledge and knowing (e.g., plausibility judgments). This presentation will feature a model on the role of plausibility judgments in conceptual change and epistemic cognition—a construct that has been well represented in many theories, but has previously received little empirical attention. We conducted a study to test the model and these results will also be discussed in the presentation. The plausibility model may serve as a useful guide for instructional practices and further research to promote epistemic conceptual change. In addition, the model may be have particular utility in framing educational research around issues of great societal importance that are controversial and/or abstract (e.g., climate change), and which also have high a ‘plausibility gap’ (i.e., scientific topics where gaps exist between what scientists and lay persons find plausible).

Facets of sustainability in higher education
The theme of sustainability has been taken up in diverse ways in education. These range from an emphasis on sustainability as a focus of the curriculum (sustainability as content) to an exploration of the implications of a sustainability perspective to the nature and content of the educational enterprise (sustainability as underpinning concept). The aim of this symposium is to explore the latter focus in the context of higher education. How has the notion of sustainability informed how we think about the nature of curriculum, pedagogy and change? Four facets will be explored through the lens of sustainability: student and teacher learning, assessment, feedback and innovation. Through counterposing different interpretations of sustainability in the educational context, the symposium aims to explore ways in which the theme of sustainability has been generative in prompting new perspectives on familiar issues, and how these issues themselves become reframed in this new conceptualisation.

**Sustainable student and teacher learning in higher education**

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This conceptual paper departs from the observation that many attempts to foster sustainable learning in students have not achieved what they intended. Possible explanations for these puzzling results are explored. It will be argued that one explanation largely neglected until now is that teachers are often instructed what to do differently, but that teacher change involves much more than being instructed what to do. Teachers need to learn as well and sustainable teacher learning involves fundamental changes in their teaching practices, beliefs, knowledge and orientations. We argue that instead of pointing out to teachers what they should do to teach in a responsible way, we need to focus on understanding and fostering sustainable teacher learning and professional development. Research domains of ‘student learning’ and ‘teaching and teacher education’ have traditionally been separated in different divisions of professional organizations like EARLI and AERA and different journals. In our view this is an unproductive situation. To achieve progress, we need to cross traditional boundaries and instead study how student learning can be related to teacher learning and vice versa. We need research on the interaction and interplay between student and teacher learning patterns. The paper presents a conceptual model of sustainable student and teacher learning from this integrated perspective.

**Sustainable assessment revisited**
Sustainable assessment was proposed in 2000 as an idea in higher education that focused on the contribution of assessment to learning beyond the time scale of the course. It was defined as assessment that ‘meets the needs of the present and prepares students to meet their own future learning needs’. This paper reviews how it has been discussed and goes on to identify issues to be taken further. It focuses in particular to the need to relate assessment practices to the goal of sustainable assessment and how sustainable assessment can link to ideas such as self-regulation, students’ making judgements about their own work and program-level assessment.

**Sustainable feedback to support the development of autonomous self-regulated learners**

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This conceptual presentation contributes to the theory and practice of feedback in higher education by exploring the notion of sustainable feedback. Feedback is sustainable when students are involved in dialogues in which they use feedback from self, peers or others to develop their capacities as autonomous self-regulating learners. The aim of the presentation is to analyze and exemplify the concept of sustainable feedback. The presentation traces the conceptual origins of sustainable feedback in terms of the notion of sustainable assessment (Boud, 2000) and current thinking (e.g. Nicol, 2013) that the main purpose of feedback in higher education should be to develop students’ capacities to make evaluative judgments about their own work and that of others. Classroom practices are reported which exemplify some of the potentials and challenges in implementing sustainable feedback practices. The centrality of assessment task design is a crucial parameter which is highlighted. The significance of the paper is twofold. First, it lies in its contribution to the theory of feedback in higher education through charting sustainability in feedback via links to student autonomy and self-regulation. Second, it explores practical implications for teaching, learning and assessment practice and some of the challenges which arise.

**Developing a framework for analysing the sustainability of innovation in higher education**

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This conceptual paper presents a framework for analysing innovation sustainability. Located in the literatures of educational leadership, change and complexity, it contends that such an analysis needs to consider how innovations develop in relation to the contextual layers in which they operate, and how this relationship impacts reciprocally on users and the lifespan of innovations. Drawing on the ecological concept of sustainable development, sustainable innovations are evolutionary in nature, adapting over time in response to emergent changes, challenges and needs in a manner that builds capacity and supports the diversity of its users. Examples from an innovative postgraduate programme in educational leadership and change are used to illustrate factors that facilitate and inhibit sustainability.
Transfer of training for sustainable learning

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Training investments are aimed at evoking sustainable learning of employees. In the era in which the importance of lifelong learning is increasingly recognized, companies demand that trainings have an enduring effect on the behaviour and further development of their employees. The concept of transfer can be used to study these effects. Studies on transfer in the past decades have revealed important components of transfer and its influencing factors. However, the exact directions and strengths of relations between transfer antecedents and transfer itself varies from study to study. This symposiums aims to contribute to the understanding of this complex interplay of variables influencing transfer of training by presenting four studies using four different methodologies. The combination of these studies gives detailed insight from different perspectives, particularly on how current theories on transfer could be extended or revised to describe transfer of training for sustainable learning. The first paper by Quesada-Pallars and Gegenfurtner is a theoretical paper, presenting a model based on the theory of planned behaviour and transfer intentions. The second contribution of Bosset and Bourgeois is a qualitative study on how perceived organizational support contributes to the employees’ intention to transfer. The third study of Endedijk, Bron, Luyten, and Sleegers presents a quantitative study which reveals new components of transfer and its influencing factors. The last paper is a meta-analytic study of Gegenfurtner, Reinhold, and Witting in which they examine the influence of workplace factors on motivation to transfer and transfer of training. A discussion of Simons concludes the symposium.

Can transfer be predicted? A theoretical model on Intent to transfer and Implementation intentions

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Past research on behavior change after training utilized the construct of intention to transfer to predict transfer of training, with mixed success. In this paper, a conceptual model is presented that aims to describe the intentional processes involved in transfer. Grounded on Ajzen’s theory of planned behavior and Gollwitzer’s theory of implementation intentions, the model distinguishes a decisional and a postdecisional phase. In the decisional phase, trainees’ transfer intentions are
predicted by attitudes, subjective norms, and perceived behavioral control. Transfer intentions and transfer commitment stage transfer, which is initiated through implementation intentions. These implementation intentions are influenced by specific plans to transfer and trainees’ commitment to these plans. The proposed conceptual model extends and combines previous theorizing because it includes attitudes on a cognitive (beliefs), emotional (feelings), and behavioral level (habits); differential subjective norms from a variety of agents; perceived behavioral control specified in trainee self-efficacy (magnitude and strength) and controllability; intentions as decisional-phase behavioral intentions and as postdecisional-phase implementation intentions; and the commitment to execute transfer plans. Implications for future research on intentional processes in transfer are discussed.

Perceived organizational support of training and learners’ personal goals

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The central issue addressed in this contribution concerns the conditions under which an employee participating in a training program outside of the organization, is likely to transfer his or her learning outcomes to his or her organization. More specifically, we will look at how certain organizational factors, in particular perceived organizational support to training, may interact with certain individual factors, in particular employee’s personal goals, in producing different profiles in terms of the employee’s intention of transfer, engagement in training and organizational commitment. To this end, a preliminary qualitative exploratory study was conducted with 20 adult students in a continuing education program at the University of Geneva, on the basis of semi-directive interviews. The preliminary results highlight four different profiles based on different patterns of interactions between organizational and individual factors, as well as their effects. It appears that the individual factors ‘moderate’ the impact of the organizational factors.

Transfer for sustainable learning: A study on a new transfer component and its influencing factors

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In this study the concept of transfer and its components are investigated. According to literature, transfer consists of generalization and maintenance. In this research an additional concept, called transfer for learning, is introduced and explored. We assume that, next to generalization and maintenance, further workplace learning concerning the training subject can be a transfer outcome that contributes to sustainable learning, which is still lacking in the current definitions. Transfer of training is assumed to be influenced by elapsed time, factors from the Learning Transfer System
Inventory (LTSI), and self-directed learning orientation (SDLO). A survey measuring these variables was distributed among employees of a large consultancy firm in the Netherlands who attended a training in structuring thoughts and communication. Factor analysis revealed that generalization and maintenance did not appear as different concepts in the factor analysis, therefore they were taken as one concept in further analyses. Transfer for learning did appear as a different component in the factor analysis. Factor analysis revealed a set of three higher order effects within the LTSI: Job Utility, Personal Orientation, and Environmental Interference. SDLO turned out to fit in the Personal Orientation factor. The higher order factors all have a significant effect on the two components of transfer. Elapsed time had a significant negative effect on generalization and maintenance. This study has produced the first indications for the existence of the new component transfer for learning. Implications for research and practice are discussed.


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Training and training investments are made sustainable to the extent that trainees transfer trained knowledge and skills to the workplace. Although the question of how (and how much) the workplace influences transfer has been addressed in past research, it remains unclear (a) which workplace factors have the strongest relationships with transfer of training and (b) whether motivation to transfer fully mediates the influence of workplace factors on transfer of training. Our findings from meta-analytic structural equation modeling of 33 independent data sources with N = 6,567 participants indicated that feedback, opportunity to use, and transfer capacity had higher influences on transfer than supervisor support, peer support, supervisor sanctions, and social norms. A partial mediation model revealed better fit than a full mediation model. The results are discussed in terms of their implications for theory building and their educational implications for making training and training investments more sustainable.

Early career academics navigating the future: Insights from non-traditional data collection methods

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Our research is situated in and motivated by the well-documented changes in higher education internationally and the impact of these changes on academic work. Increasingly, higher education policies are conceived as vehicles to develop national social and economic growth and international competitiveness. Combined with such policies are growing demands for accountability, declining academic salaries, and an increase in the number of contract positions. Further, while the doctorate was at one time perceived as preparation for an academic position, internationally more than half of all doctoral graduates leave the higher education sector whether by choice or lack of opportunity. In this context, what are the challenges facing doctoral students, postdocs and pre-tenure academics as they navigate the transition from PhD to other career? This symposium with researchers from Canada, Finland, Holland and the UK takes up this question. We particularly address identified gaps in the literature such as the lack of a longitudinal perspective (Schlosser & Kahn 2007) and of non-traditional ways of documenting experience (Suzuki et al 2007). Thus, we ask a second question: In what ways do non-traditional data collection methods contribute new insights into the experiences of doctoral, post-doctoral, and pre-tenured academics? Each paper, documenting at least one of the three roles, incorporates a non-traditional method, e.g., journey plots, visualization-based interviews. We view this symposium as significant in opening up to discussion the importance of engaging a range of data collection and analysis methods in order to provide multiple perspectives on any particular higher education phenomenon.

**Looking across time: Enhancing insight on academic challenges through weekly activity logs**

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Navigating doctoral-academic work as well as career possibilities post-PhD has been reported as challenging for some time. Within this context, we have been investigating longitudinally the experiences of doctoral students, post-PhD and newly appointed academics in the social sciences and sciences. We have been particularly interested in their intentions, hopes and goals and the ways in which they try to advance these despite unexpected constraints. This analysis focused on the challenges reported by 15 doctoral students and post-PhD researchers in the sciences. The broader study, as well as the investigation described here, incorporates different types of data collection. We expected but had not confirmed that two of these data collection methods, interviews and weekly activity logs, would bring to light different perspectives on challenges as well as responses to them. So, in this investigation we asked: In what ways might the weekly activity logs contribute different insights than the interviews into the academic challenges as well as responses reported by doctoral students and post-docs in the sciences? The analysis of the two data collection methods demonstrated differences in the challenges that emerged, with those in the logs emphasizing the day-to-day ups and downs of academic work whereas the interviews raised more existential issues. Further, the analysis showed individuals perceived varying degrees of agency, managing the day-to-day and the short-term relatively well, e.g., troubleshooting research problems, but feeling unable to see ways in which they could influence the structural elements which make establishing an academic career difficult, e.g., lack of research funding, few positions.

**What visualization-based interviews revealed about doctoral students’ engagement and disengagement?**
Previous research suggests that while many doctoral students find doctoral studies to be highly engaging there are also number of students who suffer from disengagement and even drop out from their training (Stubb et al., 2011). Such experiences often originate from the relation between the doctoral student and the scholarly community (Pyhälto et al., 2009). This study explores doctoral students’ engaging and disengaging experiences among the group of students who are at risk of dropping out from their studies. Altogether, 16 behavioural sciences doctoral students, whose PhD processes were prolonged, were interviewed. The data were collected with interviews employing visualization of doctoral journeys, and qualitatively content analyzed focusing on the engaging and disengaging episodes. The preliminary results suggested that students’ experienced engagement in doctoral work was manifested in terms of dedication, vigor and occasionally absorption. In turn, disengagement was manifested in terms of insufficiency, cynicism and sometimes exhaustion. Interestingly, the source of engagement was typically sense of belonging in the scholarly community, whereas the students often reported lack of autonomy and belonging as sources of disengagement. The experiences of belonging and lack of it thus appeared to be decisive in terms of engagement and disengagement respectively. Further, this indicates that the visualization-based interviews enabled the doctoral students to identify the critical engaging and disengaging experiences that were significant for the progress of their doctoral journeys. Such experiences may be difficult to verbalize and reach with traditional interviews because this participant group may be less active to explicate their experiences.

**Journeying from the place of new to [more] experienced supervisor**

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This paper reports on a qualitative longitudinal study of pre-tenure academics as they develop their conceptions and practices as doctoral supervisors. The study used three data collection strategies: a combined biographic, pre-interview questionnaire (details relating to academic and supervisory experiences); a journey plot (a retrospective visual representation of the ups and downs of an entire supervisory experience with one student), and a semi-structured oral interview (exploring matters arising in the pre-interview questionnaire and the journey plot). The experiences of four new supervisors in the UK, representing four disciplines - social sciences, physical sciences, humanities, and medical sciences, were explored in 2008 and 2012. Data analysis identified a number of notable themes in new supervisors’ development over time, three of which are characterised as self, student and others. This identification was enhanced by a journey plot data collection method: the visual representation of a complete supervisory experience enabled participants to reflect on and discuss the rhythm, stability and variability of supervision as a whole and their development over time, and the researcher to compare and contrast snapshots and explanations of supervisory experience across
several individuals. In this way it could be seen that visually different supervisory journeys could give rise to similarities in learning to be a supervisor.

**From ‘symbolic compliance’ towards ‘rational resignation’ amongst early career academics**

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This paper investigates 6 early career researchers, those doing doctorates and those in the post-graduation phase within three countries. The study has used longitudinal data, interviews with the same respondents in 2007 and 2011, in addition to observations and document analysis. The respondents were selected from a larger interview database. Focus lays at the increased performance-orientation of the higher education system and its impact on the career perspectives of the early career researchers, which is being expressed in two research questions: To what extent does the performance-orientation within the higher education sector have an impact on these early career researchers? In what way does it affect their personal career ambitions and decisions?

**New Frontiers in CSCL Part 1: Tools and technologies for supporting and researching regulation**

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Despite extensive research in CSCL, there is little research about how groups, and individuals in groups, can be supported to engage in, sustain, and productively regulate collaborative processes (Jarvela & Hadwin, 2012). Overemphasis on developing and testing the functionality and usability of technology-based tools for sharing information has diverted attention from the importance of how tools can be used to support the planning, monitoring, and regulation of collaborative learning processes (Cress & Hadwin, 2012). This symposium will examine tools and technologies being used to: (a) engage regulation in CSCL, (b) collect data about regulation that emerges in those contexts. Panadero and Hadwin et al. will start with a review contrasting co-regulation and shared regulation in learning and making implications for the development of regulation tools. Hadwin et al. continue demonstrating the role of scripting, visualization, and awareness tools for supporting regulation. H’melo et al. examine how to facilitate groups in PBL using video triggers and computer-based technology tools and Phielix et al. report the role of assessment and reflection to self and group performance in CSCL. The discussant will conclude how advancing the CSCL field requires attention to the roles technology can play in supporting collaboration by optimizing self-regulated learning, co-regulated learning and shared regulation.

Gress, C.L.Z., & Hadwin, A.F. (2010). Advancing educational research on collaboration through the use of gStudy computer-supported collaborative learning (CSCL) tools: Introduction to special issue.
Reviewing socially shared regulation of learning: Implications for the regulation tools

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One of the focuses on CSCL research is how team and task regulation are mediated by the interaction of the different team members. Historically, the analysis of these types of regulation has been divided into two lines of investigation: metacognition and social activity research. There is a direct influence between these two lines and two theories coming from the learning regulation field: co-regulation of learning and socially shared regulation. Co-regulation and shared regulation can occur in collaborative learning situations but they present salient distinct features that are sometimes used interchangeably in the literature. In order to advance research in CSCL and developing technologies for promoting regulation, and shared regulation in particular, within CSCL contexts we made a review to contracts co-regulation and shared regulation of learning. The review explores the theoretical and empirical differences existing between co-regulated learning and shared regulation of learning in CSCL. Exploring the differences between these two lines of research is especially relevant for the future implementation of successful interventions in collaborative learning situations as well as for the development of more specific theories about these two constructs. A literature search was performed using ERIC and PsycINFO databases. The keywords used were co-regulation/co-regulated learning and socially shared regulation/shared regulation of learning. A total of 71 hits were found for co-regulation and 11 for shared regulation.

Promoting and researching adaptive regulation in CSCL: Scripting, visualization, and awareness tools

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This conceptual paper extends our previous work articulating the important role of self-regulation, co-regulation, and shared-regulation in promoting successful computer supported collaboration (Jörvelä & Hadwin, in press; Winne, Hadwin & Perry, in press). Drawing from current research we demonstrate the role and effectiveness of scripting, visualization, and awareness tools for supporting regulation in collaboration. The paper concludes with targets for future research and discusses challenges for theory, research and practice.

Supporting International Problem-based Learning Using CSCL Tools
The goal of this study is to examine how to facilitate cross-cultural groups in problem-based learning (PBL) using video triggers and computer-based technology tools. Medical students from Asia and North America participated in two sessions and watched physicians deliver bad news to a patient in two video cases. Experienced facilitators help support collaboration in the two PBL sessions. An expert facilitator provided advice using a chat box in the video conferencing system. This study examines strategies and challenges in facilitating PBL across distance and cultures using both an inductive analysis and Community of Inquiry analysis scheme. The inductive analysis suggests that one of the roles of the facilitator is to model metacognitive strategies. Several questions are proposed for future research that focuses on the role of regulation of learning.

**Using an assessment and reflection tool to regulate self and group performance in a CSCL environment**

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There is a tenuous relationship between students’ self perception and their actual performance. The tendency to believe that they are performing effectively, while they are not, undermines their group performance. In this study, two groups used a self and peer assessment tool (Radar) with or without a reflection tool (Reflector) in a CSCL-environment to enhance group performance. Radar allows students to assess themselves and their fellow group members on six traits related to social and cognitive behavior. Reflector enhances self and group regulation by stimulating group members to reflect individually and collaboratively on their past, present, and future functioning. The underlying assumption was that Radar in combination with Reflector would lead to enhanced social and cognitive group performance, more reliable peer assessment scores, and more valid perceptions of the social performance of the group. Participants consisted of 191 second year university students working in groups of three, four and five on a collaborative writing task. Results did not show that the combination of Radar and Reflector led to enhanced social and cognitive group performance. Results did, however, show that supplementing a self and peer assessment tool with a reflection tool, led to more consensus among raters, more moderate and less optimistic self and peer perceptions, and more valid judgments of social performance. Findings indicate that self and peer assessments should be combined with reflection prompts aimed at future functioning in order to allow students to regulate the social and cognitive activities of themselves and the group as a whole.

Fostering student thinking and engagement in teacher professional development

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Aims. The aim of the symposium is to strengthen empirical research on TPD and the effects of TPD components on teacher learning. Thereby, the symposium is focused on a key element in TPD: to foster teacher learning with regard to student thinking and student engagement. The studies in this symposium present various approaches of TPD in different domains. They especially enhance teachers to focus on pedagogical content knowledge and general pedagogical knowledge. In the first study, it is investigated how to use classroom observation protocols for instructional improvement. The second study focuses on the question how teacher educators stimulate their student teachers’ meaning-oriented learning and deliberate practice in their respective courses in a dual teacher
education program. The third and fourth study present findings from a long-term PD program that enhances teacher learning with regard to changing perspectives towards student understanding and learning. The third study concentrates on mathematical problem solving and presents findings with regard to discussions of teacher leaders who encourage teachers to critically analyze student reasoning and think deeply about their teaching. The fourth study investigates the teacher’s role in classroom dialogue and concentrates on general pedagogical knowledge. Scientific and educational relevance. Responsible teaching also demands an effective teacher professional development. This symposium contributes to a growing body of empirical knowledge about effective TPD and about how experienced teachers’ pedagogical content knowledge and pedagogical knowledge can be fostered to build on student thinking and learning.

**Leveraging Observation Protocols for Teacher Learning**

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Although classroom observation protocols in teacher evaluation systems are gaining in popularity across the United States, relatively little research has investigated how to use the information gained from such observations to improve the quality of classroom practice. This presentation will focus specifically on a research study that investigates how to leverage such observation instruments for instructional improvement. The study involves providing professional development on practices identified in a structured observation protocol (Protocol for Language Arts Teaching Observation) to a group of middle school English Language Arts teachers in one urban school district and tracking how professional development targeted at two elements from the observation protocol affects changes in teachers’ views of instruction, teacher practice, and ultimately student achievement.

**Educator learning through collaboration in research**

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Collaborating with researchers in addressing a key issue in educators’ teaching practice in a structured and systematic way is assumed to be a powerful stimulus for learning. In this study, we collaborated with two pairs of educators in addressing how they could stimulate their student teachers’ meaning-oriented learning and deliberate practice in their respective courses in a dual teacher education program. These year-long collaborations encompassed joint lesson preparation and evaluation, based on theory as well as existing practice and supported by so-called ‘mirror data’ from practice and conceptual models of student teacher learning. In this paper we question what features of the collaboration in research where critical for educators’ learning and teaching, as well
as how this impacted student teacher learning. Based on a grounded and open content analysis of pre- and post-interviews with educators and logbook notes, we conclude that the position of the educators as experts, of the researcher as learner and of the research as integrated where critical for the educators’ active engagement and learning. Based on a similar analysis of lesson plans, classroom observations and student teachers’ exit slips, we conclude that student teacher learning was especially impacted when the research aims for student teacher learning could be meaningfully integrated in the course objective and existing structure. This, in turn, extends existing ideas on the role of the researcher or trainer in professional development initiatives and argues that the learning promoted benefits from becoming meaningfully integrated the teaching activity.

**PD facilitation practices that foster teachers’ ability to build on student thinking**

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The Problem-Solving Cycle (PSC) is an iterative, long-term approach to teacher professional development. Each cycle consists of a series of interconnected workshops organized around a rich mathematical task and is designed to foster teachers’ exploration of mathematical content, student thinking, and instructional practices within a supportive professional learning community. An initial design research project to develop the model provided some evidence for its effectiveness in changing teachers’ instructional practices (Koellner, et al., 2011). Our current project, Implementing the Problem-Solving Cycle (iPSC) was designed to investigate the scalability of the PSC model. More specifically, this 5-year program aims at preparing Teacher Leaders (TLs) to implement the PSC. This presentation examines the PD that the TLs provided for teachers in their schools. We present an analysis of the facilitation moves that supported in-depth discussions about mathematics, student thinking and instructional practices. Our first phase of analysis indicates that TLs used guiding questions in similar ways to launch conversations about the PSC math tasks and video clips of PSC, and that they differed in the ways they extended conversations and their use of materials and representations. The next phase of analyses will examine whether differences in facilitation practices are associated with differences in the cognitive depth of workshop discussions, and whether some types of facilitation moves are more effective at encouraging teachers to critically analyze student reasoning and think deeply about their teaching. This research contributes to our understanding of professional development and has implications for the preparation and support of PD leaders.

**Teacher learning on classroom dialogue and its impact on student interest and motivation**

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Research on student interest and motivation reports a drop in these areas in math and science instruction in secondary education. A reason for this decrease is seen in the way of how teachers interact with students in classroom dialogue (Jurik, Gröschner & Seidel, in press). This study aimed at investigating the significance of productive classroom dialogue on student interest and motivation over one school-year by implementing effective components of teacher professional development (TPD) highlighted in recent research (Desimone, 2009). For that reason, we examined the effects of a video-based teacher learning approach of TPD (nine teachers in the intervention group) on students’ interest, intrinsic motivation and basic psychological needs (SDT), in comparison to a standard TPD program (eight teachers in the advanced control group) without the use of video elements. The study revealed, that with regard to interest and intrinsic motivation, scores in the intervention group (n = 222 students) increased significantly compared to the advanced control group (n = 179 students).

Regarding the aspects of SDT (autonomy, competence, relatedness), we found no significant effects over the school year between the groups but a positive trend in the IG (from pre to post) and a negative trend in the ACG (from pre to post). The study emphasizes that a systematic approach of TPD, which takes effective components into account can lead to positive effects in student learning outcomes in math and science classrooms.

**Task-avoidant achievement behavior in middle childhood: Antecedents and consequences**

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Task-avoidant behaviour refers to individual’s tendency to avoid challenges in achievement situations rather than making active attempts to deal with them. Increasing evidence has shown that such behaviour has negative consequences for students’ academic outcomes and skill development. However, less is known about the predicting factors of task-avoidant behaviour, particularly during the early school years. This symposium, consisting of four studies conducted in Finland, Estonia and UK, contribute to previous research by providing insight on the antecedents and consequences of
task-avoidant behaviour in different achievement situations. The first paper (Hirvonen et al.) shows that temperamental characteristics play a different role in students’ active and passive forms of task avoidance. The second paper examines mutual relations between students’ task-avoidant behaviour and psychological adjustment. The third paper examines relations between students’ planning skills and task-avoidant behaviour, and their predictive role in later math achievement. The fourth paper (Malmberg) investigates the relationships between situation-specific motivation and school performance, and task avoidance. The papers indicate that besides cognitive and motivational factors, dispositional characteristics and psychological adjustment contribute to achievement behaviours in middle childhood. The results provide implications both for theory and practice.

**The Role of Temperament in Children’s Task-Avoidant Behaviours in Achievement Situations**

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Students differ from each other in their behavioural responses to learning tasks. Some students are enthusiastic and focused, while others become anxious and passive, or actively try to avoid the tasks. Besides of cognitive and motivational factors, these different responses can be explained by the effects of students’ dispositional traits, such as temperament. This study examined to what extent children’s temperament contributes to their active and passive task avoidance in achievement situations. Teachers rated children’s (n = 152) temperamental characteristics (distractibility, inhibition, mood, and negative emotionality) in the fall semester of their first year in primary school. Children’s active and passive task avoidance were rated in test situations in the fall and spring semesters. The results showed that the more easily distracted the children were, the more active avoidance they showed, and the more their active avoidance also increased during the first grade. Moreover, the level of children’s passive avoidance was positively predicted by a high level of inhibition. The findings suggest that individual differences in temperament should be taken into account when reasons for children's task-avoidant behaviours are considered. Help and support for children with active or passive forms of task-avoidant behaviours should be planned individually.

**Longitudinal Associations between Psychological Adjustment and Task Avoidance in Early School Years**

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This study examined student’s (n = 378) psychological adjustment and its reciprocal associations with task avoidance from Grade 1 to Grade 2 as part of a large longitudinal follow-up conducted in Finland. Teachers assessed students’ psychological adjustment using Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) which produces scales for hyperactivity, conduct problems, emotional symptoms, peer problems, and prosociality. The students’ use of task-avoidant strategies was evaluated by mothers and fathers. This paper reports findings on the cross-lagged relations between psychological adjustment and task avoidance. The preliminary analyses showed that SDQ scales and task avoidance were relatively stable from Grade 1 to Grade 2, the autocorrelations ranging between .56 and .84. Tentative evidence was found for the reciprocal associations between psychological adjustment and task avoidance. For both girls and boys, higher hyperactivity in Grade 1 was significantly associated with higher task avoidance in Grade 2, evaluated by mothers and fathers. Higher task avoidance in Grade 1 was, in turn, related to higher hyperactivity in Grade 2. Similar reciprocal associations were found for peer problems and emotional symptoms, and task avoidance in boys. Girls’ conduct and peer problems and emotional symptoms and boys’ conduct problems and lower prosociality in Grade 1 were associated with higher task avoidance in Grade 2, but not vice versa. These findings indicate that psychological adjustment and problems in child’s achievement strategies form cumulative developmental patterns that may create less than optimal conditions for learning at school, starting from early school years.

Transactional Relations between Planning and Task Avoidance, and their Role in Math Achievement

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The study examined transactional relations between planning skills and task-avoidant behaviour in first and second grade, and their predictive role in math achievement in third grade. Additionally, the relationships between the planning skills, task-avoidant behaviour and math achievement were analysed in groups with different performance levels. The participants were 872 children (52 % boys) and 53 teachers. Planning was assessed with tests and avoidance with teacher reports in first and second grades. Math achievement was tested in third grade. SEM was used to examine transactional
relations and to explore the extent to which children’s planning and task avoidance in the first two grades predicted their math achievement in the third grade. To assess the variability of combinations and types in the different performance level groups, the Configural Frequency Analysis was performed. Results showed that planning in first grade predicted avoidance in second grade, but not vice versa. Planning skills in first grade and task avoidance in first and second grade predicted math achievement in third grade. The planning skills in the second grade were indirectly related to math achievement via task-avoidant behaviour in the second grade. Low math achievers were characterised by combinations of stable and nonstable low or average planning skills with stable and nonstable high and average task-avoidant behaviours. The relationships between planning skills, task-avoidant behaviour, and later academic success stress the need to pay more attention to children whose planning skills are low and who tend to use task-avoidant strategies in school.

**Students’ Situation-specific Motivation, and Teacher-reported Task Avoidance and School Performance**

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Going beyond studies of individual differences in student motivation, the present study investigated students’ situation-specific intrinsic and extrinsic motivation, and their teacher-rated general task avoidance and school performance. A total of 282 5-6th grade primary school students reported on an average of 11.8 lessons (SD = 5.34) with the same teacher during one week, using Personal Digital Assistants (PDAs). Teachers rated students once. Multilevel Structural Equation Models (MSEM; time-points nested within students) showed that students’ average intrinsic and extrinsic motivation were negatively related to task avoidance. A random slopes model including school performance showed that relatively higher performers felt less intrinsically motivated, and lower performers more intrinsically motivated, when their extrinsic motivation was high. School performance predicted task avoidance but not intrinsic motivation. Intrinsic motivation predicted lower task avoidance. Overall, the findings suggest that students’ perceptions of extrinsically motivating teacher style vary across situations in relation to their school performance.

**Modeling Students’ Responses to Ordered Multiple Choice Items**

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Learning progressions are empirically-based descriptions of how students’ thinking becomes more sophisticated over time (National Research Council, 2007). They have the potential to ground the design of standards, curriculum, instruction, and assessments in cognitive models of students’ thinking. However, both the development/refinement of learning progressions and the utility of these tools for diagnosing students’ thinking relies upon methods for eliciting and interpreting students’ thinking with respect to the learning progression. One such method relies upon ordered multiple-choice (OMC; Briggs et al., 2006) items. However, the use of assessment items to diagnose
student thinking requires cognitive models of students’ responses to these items (Gorin, 2006). While learning progressions provide a foundation for modeling students’ responses, we argue that more detailed understanding of item difficulty and of students’ approaches to OMC items is required to fully model students’ responses to these items. In this symposium, we present four different approaches towards understanding students’ responses to OMC items: eye tracking, think aloud protocols, exploration of variation in students’ responses to items assessing similar content, and psychometric modeling of students’ responses. Our goal is to contribute to greater understanding of the relationship between students’ responses and the underlying learning progression in order to use this special type of assessment item to a) inform revision of learning progressions and b) diagnose student thinking with respect to learning progressions.

**Investigating Response Strategies for Multiple-Choice Items: An Eye Tracker Study**

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One consideration in modeling responses to ordered multiple-choice (OMC) items is how students approach, in general, multiple-choice (MC) items. However, little is known about the cognitive processes students employ in answering such items. Therefore, this study aims to identify the strategies used when answering MC items. Findings from existing studies indicate that a person’s expertise in the subject matter is of great importance for answering MC items; however, most of these studies focus on strategies for answering MC items using only indirect measurements. With eye-tracking, it is possible to determine where students’ attention is directed while they answer MC items. Thus, fixations of eye-movements give us insight into item response processes. This study involves analysis of the eye movements of 30 university students as they responded to 21 MC items about the brain and nervous system; some students were considered experts with respect to this topic, while others were considered novices. Our analyses revealed different strategy use for experts as compared to novices: Experts made more overview scans, while novices exhibited more focused behavior. In other words, novices tended to make comparisons between the question and response options, while experts tended to look at the question and the response options one after another, in a more holistic way. The results indicate that expertise plays a more important role in response behavior than item characteristics such as item difficulty or the position of the right answer.

**Using Think Alouds to Explore the Cognitive Validity of Ordered Multiple-Choice Items**

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Ordered Multiple Choice (OMC) items have been proposed as a means to diagnose students’ state of understanding along a possible learning progression. In OMC items, each of the possible response options corresponds to a specific level of an underlying learning progression. But in order to provide more diagnostic information than typical multiple choice items, students’ response behavior must reflect their understanding of the construct measured. That is, evidence about the cognitive validity of OMC items is required. In this paper, we present the findings from a think-aloud-study with N = 11 students from grade 6 (n = 3), grade 9 (n = 4), and grade 12 (n = 4). We investigated the cognitive validity of 8 OMC items selected from a pool of 40 OMC items utilized in an earlier study with N = 1364 students. The items covered four aspects of students’ understanding of the matter concept (2 items per dimension) as defined by the underlying learning progression. Our findings suggest that 9th and 12th grade students’ choice of response option was mainly based on cognitive processes related to their understanding of the matter concept, whereas 6th graders’ choices were mainly based on other, non-matter-related cognitive processes.

Using Item Features to Explore the Consistency of Students’ Responses to OMC Items

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The use of assessment items to diagnose student understanding relative to a learning progression relies upon the assumption that students at a given level of the learning progression will provide responses to assessment items that are consistent with that level. However, available evidence documents the inconsistency of students’ responses to assessment items targeting the same underlying principles. In this paper, we explore 1,088 high school students’ responses to pairs of ordered multiple-choice (OMC) items linked to a force and motion learning progression. Within each pair, a similar question is asked in two different item contexts. Through cross-tabulations of these responses and cognitive interviews with an additional 24 students, we explore the consistency of students’ responses to the pairs of items and possible explanations for their apparently inconsistent responses. We identify factors that may influence responses to OMC items: the familiarity/unfamiliarity of the item context and presence of features such as weight, gravity, and whether force is exerted by an animate or inanimate object. Awareness of these factors may influence instruction, assessment design, revisions to the learning progression, and/or reconsideration of the learning progression construct.

Modeling Responses to OMC items: Taking into Account Test-Taking Behavior

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This paper provides a discussion of different approaches to the psychometric modeling of ordered multiple-choice (OMC) items. OMC items are based on a learning progression, i.e. a hierarchy of levels of students’ understanding of a particular domain. Data obtained through the use of OMC items can be used to diagnose student understanding relative to a learning progression (e.g. Alonzo & Steedle, 2009; cf. Briggs & Alonzo, 2012). However, depending on the psychometric model applied to the data, findings may change. This study compares the effect of guessing on OMC items on the robustness of different modeling approaches. A comparison is made between Rasch models for separate levels of understanding, the partial credit model (PCM) and the Nedelsky model. It is found that the PCM will over-estimate levels of understanding as compared to the Rasch and Nedelsky models in cases where students (partly) guess the correct option. This paper contributes to discussion of the validity of the assessment of students’ understanding using OMC items.
Toward a framework for studying graphicacy

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Literacy and numeracy have long been regarded as fundamental capacities underpinning all aspects of education. However, with the rapidly increasing reliance on graphic forms of representation in educational materials, graphicacy has emerged as another fundamental capacity that learners need to develop. Graphicacy can be broadly defined as a set of capacities concerned with interpreting and generating information in graphic form (de Vries & Lowe, 2010). While there has been extensive empirical research as well as theoretical developments into the nature of literacy and numeracy as well as their acquisition, this is not the case for graphicacy which has rather been an implicit aspect of many other studies with very diverse goals. More systematic empirical, methodological, and theoretical investigations are required to delineate the boundaries of graphicacy. The goal of this symposium is to investigate with more sophisticated methods the nature of graphicacy abilities, as well as their cognitive underlying processes basis, by identifying the characteristics that distinguish it from other capacities such as literacy and general comprehension abilities. Four papers are included in the symposium. Two empirical papers examine the need, and the effect, of specific graphicacy abilities in processing paired graphics in children and adults and in resolving mathematical graphics in elementary school. The third paper gives an original overarching methodological framework which addresses important issues relative to the need for new method of investigation. A fourth paper investigates students’ preferences and beliefs regarding visual displays as a component of graphicacy and their link with graphic comprehension performances.

Elementary students decoding graphic tasks: Understanding graphic conventions

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Graphicacy is becoming influential in the field of mathematics education, both from teaching practice(s) and assessment perspectives. Increasingly, students are being asked to interpret and decode mathematics problems that contain graphics information. Two empirical researches with 8-12 year olds highlighted the challenges students face when decoding static graphics in mathematics and explores the ‘graphicacy proficiency’ required to fully understand such tasks. The results, revealed that the cognitive processing required to solve assessment tasks have more to do with the ability to decode the graphic embedded in the task rather than knowledge of mathematics content. Specifically, the results show that (1) the spatial demands embedded within the graphic and (2) students limited understanding of graphic conventions where the primary contributors of student error.
Paired graphics: exploratory studies of graphicacy in adults and primary school children

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Adults and children viewed about thirty varied paired graphics derived from school science textbooks and explained meaningful aspects of each item. Verbal responses and eye tracking results indicated that while adults participants understood most of the items and directed their attention to high relevance aspects of the graphics; children had lower score and did not always direct their attention only to relevant features. In adults, although some variables, such as the typicality of the graphic pairs appeared to influence comprehension, others such as content complexity seemed to have no effect. In children three main categories of errors were found, which were mostly related to the design of the paired graphics. The findings will be used as baseline data for current studies of younger children’s approaches to paired graphics and more formal investigations of the nature of graphicacy.

Investigating Graphicacy

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Graphicacy is a capacity that is necessary for student success in modern visually-oriented learning environments. However, until research can provide a better understanding of what constitutes graphicacy, it is likely to remain a relatively neglected aspect of formal education. Researchers currently lack established methodologies and tools for conducting empirical investigations of graphicacy, particularly with respect to its process-oriented aspects. Literacy and numeracy researchers are not hampered by similar restrictions. Recruiting or adapting existing approaches such as those used for research on text processing or multimedia learning are likely to be inappropriate for graphicacy investigations. Instead, researchers need to devise new types of stimulus materials and response tasks that are well matched to the very particular nature of graphics and how they represent information. Approaches that fail to take proper account of the distinctive sign system upon which graphic representations are based severely limit what can be discovered about how they are processed. This presentation examines the need to develop innovative approaches to how such research is conducted. It uses examples from recent research to illustrate some possible ways of
designing and implementing empirical studies that will help to clarify the nature of graphicacy and how it develops. The implications for future empirical and theoretical work in this area are discussed.

**Students' preferences and beliefs regarding visual displays as a component of graphicacy**

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The literature on how students process graphics in domains in which they are not knowledgeable, suggests that they possess some general knowledge and skills on how to interpret, generate and evaluate graphics over a large variety of types and domains, what we call here graphicacy. Few studies investigated the subjective components of graphicacy, in the sense of preference and perception of self-effectiveness with different features of graphic displays. In an experimental study, we investigated whether subjective preference and effectiveness of enhanced graphics were related to performance in tasks involving the mental representation of a 3D object. Participants studied an animated or a static version of a 3D realistic visualization displaying an anatomical structure in different orientation views. The results showed that students preferred animated and realistic displays. They also reported being more effective with them. Moreover, there were positive correlations between the preference and effectiveness ratings of animated displays and performances on a task involving mental rotations. These findings suggest that students' preference and beliefs of effectiveness are somehow related to performance, but more research is needed to understand this link.

**Research using the Classroom Assessment Scoring System (CLASS)**

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As a standardized classroom observation tool CLASS is a widely accepted as reliable source of information to assess teachers’ strength and weaknesses. Its multidimensional approach has proven to help teacher training institutions and school administration in providing differentiated feedback to
teachers. More recently, educational researchers in the United States and Europe have discovered the strength of CLASS as a empirical tool to advance theory of instruction and learning. Different from other observational tools, CLASS requires rigorous coder training to maximize inter-coder reliability. This symposium showcases a) the robustness of the CLASS coding system across different cultures and b) the usefulness of CLASS to further our knowledge in several area of educational psychology and research on instruction.

**Quality of Teacher–Child Interactions in Finnish Kindergartens and its Relations to Child Outcomes**

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The present study examined the validity and reliability of the Classroom Assessment Scoring System (CLASS; Pianta, La Paro, & Hamre, 2008) in Finnish kindergartens, and the extent to which the observed quality of teacher-child interactions is associated with children’s academic and motivational outcomes. Forty-nine teachers were observed by trained investigators on their quality of emotional support, classroom organization, and instructional support. Children’s (n = 1,268) pre-math and pre-literacy skills were measured at the beginning of the kindergarten year. Their math skills and phonological skills were measured at the end of their kindergarten year. Children were interviewed regarding their learning motivation, and their task-avoidant behavior was evaluated by their teacher at the end of the kindergarten year. Results confirm the three-factor structure of the class coding system found previously in the U.S contexts. As predicted, teacher-child interactions were related to kindergarteners’ motivational outcomes, namely, task focus and learning motivation. Children’s motivational outcomes, in turn, contributed to their academic skills. In addition, kindergarten teachers increased the quality of teacher-child interactions in classes where children had low average pre-literacy skills. The present study adds to our current understanding of the relevance of observed teacher-child interactions for children’s motivational outcomes in kindergarten settings.

**Classroom interactions at the beginning and at the end of elementary school in Portugal**

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University of Porto  
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Ana Isabel Mota e Costa Pinto  
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A growing body of research points to the important role of classroom interactions to enhance children’s learning (Hamre & Pianta, 2005). However, little is known about the extent findings generalize across different teaching cultures. In this study, we investigated the global classroom environment and teacher-child interactions in Portugal at the beginning and end of elementary school (1st and 4th grades). We examined the classroom experiences and levels of classroom interaction quality, and the extent to which the quality of classroom interactions predicted literacy skills. Participants were 119 target children enrolled in 72 1st grade classrooms and 84 target children enrolled in 67 4th grade classrooms. First and 4th grade classrooms were observed using the k-3 version of CLASS (Pianta et al., 2006) in the middle of the school year; children were assessed using direct measures of literacy skills at the end of the school year. Results indicate similar patterns of classroom experiences at the beginning and end of elementary school for Portuguese children, with moderate levels of quality for emotional and organizational climate although rates, particularly for instruction, tend to become increasingly lower in quality. Results additionally show that the quality of classroom interactions in both grades was related to children’s literacy outcomes, highlighting its importance to student learning.

Low and high inference data on teaching: Validation of mobile eye tracking using CLASS assessment

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Over the last decade, the technology of mobile eye tracking (MET) has evolved to a level that allows for its use in regular classroom settings as a low-inference measure of teachers attention. MET can measure how much attention teachers give to individual students. This gives rise to the question whether the (un)equality of the distribution of teacher attention across students could serve as a
low-inference marker for aspect of classroom quality measured with the Classroom Assessment Scoring System (CLASS; Pianta, Hamre, LeParo, 2008). In our initial MET study, 52 novice and experienced teachers taught a regular class period (grade levels ranged from 1 to 11) wearing mobile eye tracking glasses. Student fixations were coded. Inequality of attention to students was measured using the GINI index. The footage from two stationary digital cameras was used to assess the quality of instruction by at least two independent recently certified CLASS coders for a subset of MET study classrooms. The profile over classroom quality across the 10 CLASS dimensions was similar to the norm distribution. The GINI index did not correlate with the scales of emotional and instructional support. A significant negative correlation was found with behavioral management, suggesting that teachers are more successful at behavioral management of the classroom if they make an effort to distribute their attention evenly across the students.

**Using CLASS to Examine Teacher Practices in Elementary and Middle School Classrooms**

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The transition to middle school marks the beginning of a downward trend in academic achievement for many children in the United States. Stage-environment fit theorizes that the classroom context changes in ways that are less supportive of early adolescent students’ needs. Student and teacher perceptions are important to understanding their experiences but such measures do not describe particular teacher practices or the interactions between teachers and students. Our research capitalized on recent advances in observational measures of classroom context, the Classroom Assessment Scoring System (CLASS; Pianta, Hamre, LeParo, 2008). We observed 58 math and science classes (about half 5th grade classes from 12 k-5 elementary schools and half 6th grade classes from 6 middle schools). For most dimensions of emotional support (positive climate, negative climate and teacher sensitivity) and classroom organization (behavior management, productivity, instructional learning formats) classes were found to be high quality in both elementary and middle school classes. Two features of instructional support (quality of feedback and instructional dialogue) were of moderate quality in elementary school classes and low quality in middle school classes. Regard for student perspectives was also moderate in elementary school classes and low in middle school classes. Thus, intervention should focus on early adolescents’ needs for autonomy and competence (by targeting middle school teacher practices in relation to regard for student perspectives, quality of feedback and instructional dialogue).

**Sustainable learning and teaching environments for meaningful help seeking**

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Today’s multiple and challenging education goals set demands for educators to provide motivating, creative, and powerful learning environments which make sustainable learning possible. Sustainable learning rests on learning processes and strategies which are meaningful, reflective, and self-directed. Help seeking is an important strategy of self-directed learning, but research on help seeking has not put emphasis on sustainability so far. Therefore, the aim of this symposium is to bring together four programs of research conducted in different countries which focus on sustainable learning and teaching environments for meaningful help seeking. The presentations allow us to explore new or understudied directions in help-seeking research and connect it to recent developments in educational practice, by (1) addressing supports for and barriers to help seeking among diverse student populations (school-age, university, students with special needs), (2) addressing both cognitive and social-motivational influences, and (3) considering not only students, but also teachers as both providers and seekers of help. More precisely, the presentations focus on factors that interfere in the selection of the preferred help source in higher education, on the influence of teachers’ interpersonal motivation and behaviors on supporting student help seeking, on the specificities of help seeking in students with a visual impairment, and on student teachers’ help-seeking behavior. All these presentations contribute to our understanding of help seeking and especially to opening discussion for establishing environments which make sustainable learning possible.

**Personal and impersonal online and non-online academic help seeking sources in higher education**

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An important decision for students is where to go when they need academic help. Two research paradigms in help seeking research—one focused on technology and cognitive processes, the other on social-motivational issues—inform the study of such decisions. 1,044 students from a large U.S. university reported the likelihood that they would seek help from a range of online and traditional helping sources. Research questions were: 1) Which helping sources do students prefer? and 2) How do several demographic and social-motivational variables predict their preferences? Students reported being most likely to seek help by accessing class materials, online search engines, and class-specific online resources. They preferred going to peers and instructors for help in person more than online. Less preferred were thinking about the problem on one’s own and going to the library. Regression models examined how students’ academic achievement, gender, motivation regulation, companionate peer relations, and value for school predicted these preferences.
Considering a wider range of student helping preferences contributes to our understanding of the help-seeking process and provides a road map for those responsible for providing academic help during a period of expanding online options in higher education.

**Striving to connect: Teachers’ motivation for teaching and student help seeking**

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Why are students more likely to turn to some than to other teachers when they need help with their schoolwork? I shall propose that the quality of teachers’ motivation for teaching plays an important role. First, I reasoned that students will tend to seek needed help from teachers who care about them. Second, extrapolating from Butler’s (2012) achievement-goal approach to teacher motivation, I reasoned that teachers who pursue relational strivings to achieve close and caring relationships with students will promote help seeking (HS) by displaying social support for students. I shall present two new studies. Participants in Study 1 were 341 teachers in Israel who reported on their achievement goals at the beginning of the year and on their classroom behaviors several months later. Participants in Study 2 were 51 teachers and 1281 students in one class per teacher. Data were analyzed with SEM (Study 1) and HLM (Study 2). Results confirmed that teacher relational goal uniquely predicted teacher and student reports of teacher social support. Most important, relational goal predicted students’ adaptive HS via the relation with teachers’ social support. In contrast, mastery strivings to learn and develop professional competence, another positive achievement goal for teaching, predicted cognitively stimulating instruction and student interest, but not social support and student HS. Results contribute to understanding classroom help seeking by demonstrating the role of teachers’ interpersonal motivation and behaviors in supporting this inherently social coping strategy. They also contribute to the emerging field of teacher motivation.

**Help seeking in students with special educational needs: The case of visual impairment**

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Our aim was to investigate the specificities of help seeking in blind and partially sighted students: Does blind students’ help seeking differ from partially sighted students’ help seeking? We developed a 25-item questionnaire tapping visually impaired French upper and lower secondary school students’ mathematics-related help-seeking behaviour at school (during mathematics lessons) and outside school (while revising mathematics lessons and doing mathematics homework). The questionnaire was addressed electronically to the members of a network of parents of visually impaired children and a network of mathematics teachers of visually impaired students. The results
showed that during mathematics lessons, blind students’ questions almost exclusively concerned the content of the lesson, whereas partially sighted students’ questions were evenly distributed between the content of the lesson, the text or the graphics the teacher had written or projected on the board, and the written documents provided by the teacher. This finding may reflect the fact that the text or the graphics written or projected on the board and the written documents provided by the teacher are not at all accessible to the blind students all of whom use Braille in our study; partially sighted students, on the other hand, who use print in our study, try hard to decipher the written or projected material used by the teacher and therefore need more assistance. More research, in particularly observations in real learning situations, are necessary in order to fully understand visually impaired students’ mathematics-related help seeking.

Born to be experts in help seeking? Elements of student teachers’ help-seeking behavior

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Several factors have been identified which enhance or prevent learners’ help seeking in classrooms, such as the learners’ prior knowledge, achievement level, and personal goals. Social and emotional factors play an important role in help seeking, too, because the help seeker has to approach others in order to receive help. In classrooms a teacher is regarded as the first and the most valuable help source. However, we know that learners prefer using various help sources and that some learners prefer asking for help from some teachers rather than from the others. It is taken for granted that teachers, who are experts of teaching, will automatically be experts in help seeking and help giving. This study aimed to investigate student teachers’ help-seeking behavior in their own learning just at the beginning of their first university year in pre-service teacher education. The results through questionnaires revealed that students reported seeking always help when necessary. However, they announced that they prefer seeking help from a teacher in informal rather than formal situations. With respect to help sources internet was reported to be less popular and quite useless for seeking help successfully. These results alone should set our alarm bells ringing and the role of pre-service teacher education for preparing student teachers to become more aware of the importance of help seeking and the factors which affect learners’ help seeking should be seriously discussed.

Preschool teachers’ attitudes, beliefs and professional knowledge in the area of mathematics

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It has been repeatedly shown that the precursory mathematical skills which children master at preschool are highly relevant for future mathematical learning. Several initiatives in many countries seek to foster mathematics in preschool. The preschool teacher has an integral role in fostering children's mathematical abilities. However, models of teacher training differ between countries. Consequently it can be assumed that preschool teachers' competencies differ also between countries. In this symposium, perspectives from Israel, Germany and Switzerland will be integrated. Research findings on preschool teachers' attitudes, beliefs and professional knowledge in the area of mathematics will be presented and discussed. The first paper describes a framework for investigating preschool teachers' knowledge and self-efficacy needing for teaching mathematics to young children.

The second paper draws on the development of diagnostic pedagogical content knowledge. The third paper focuses on educators' beliefs and investigates beliefs on early mathematics education can be described and how different types of early mathematics fostering can be embedded in the pedagogy of early childhood educators. Finally, the fourth paper explores the associations between emotional attitudes, pedagogical beliefs and professional knowledge in the area of mathematics. The symposium brings together quantitative and qualitative methods and aims to shed light on the structure of preschool teachers' competencies. The impact for current approaches in teacher training will be discussed.

Preschool teachers' mathematics knowledge and mathematics self-efficacy needed for teaching

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The preschool teacher has an integral role in fostering children's mathematical abilities. This paper describes a framework for investigating preschool teachers' knowledge and self-efficacy needing for teaching mathematics to young children. It illustrates elements of the framework with examples taken from questionnaires used in our research with preschool teachers. Initial results showed that preschool teachers' knowledge varies between tasks and likewise their self-efficacy. The study contributes to the knowledge gained within the two distinct domains of number and geometry regarding the interrelationship between preschool teachers' mathematics knowledge and their related self-efficacy beliefs. The framework itself can serve as an advanced organizer for professional development.

Developing diagnostic pedagogical content knowledge for preschool teachers
Diagnostic pedagogical content knowledge is the condition for identifying emerging mathematics in children’s play and for recognizing children’s competencies in order to support children. Many professionals didn’t have the possibility to develop diagnostic pedagogical content knowledge because mathematics education has not been part of their own pre-service education. This is especially true for Germany. Consequently, there is a need for in-service education with substantial pedagogical mathematical content. In this study, a special pedagogical mathematical content will be investigated: different processes for identifying quantities. It will be examined if and how this content is substantial for the development of the professionals’ diagnostic pedagogical content knowledge.

Early childhood educators’ beliefs and pedagogies on fostering mathematics

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It has been repeatedly shown that the precursory mathematical skills which children master at kindergarten are highly relevant for future mathematical learning. Several initiatives seek to foster mathematics in kindergarten, such as training programmes or approaches deploying board and card games. Within a quasi experimental design children’s learning outcome in the three groups (training programme; play-based, control) were compared and the educators were interviewed regarding their beliefs on mathematical fostering in kindergarten, their experiences and their evaluation of the intervention. On the basis of a content analysis kindergarten educators’ beliefs on mathematical fostering and their relevance for their pedagogy are explored: How can the educators’ beliefs on early mathematics education be described? How can two types of early mathematics fostering, training programmes or play-based approaches, be embedded in the pedagogy of early childhood educators? With regards to mathematics fostering in general, most educators are positive, but their beliefs differ widely. Some emphasise goal-based pedagogy. Others are highly critical towards instructional learning and emphasise a non pressured belief, with an understanding of learning as needing to be child-initiated. It can be concluded that the play-based fostering is more in tune with the beliefs and the pedagogy in kindergarten. Challenges for professionalization as well as mathematical fostering are outlined.
How are preschool teachers’ emotional attitudes towards mathematics related with their knowledge?

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With respect to preschool teachers different aspects of their professional knowledge are regarded as important prerequisites. In addition, pedagogical beliefs and orientations as well as emotional and motivational aspects are discussed as important competencies. In this study we focus on the educational objectives in the area of emerging mathematics and investigate the following aspects: joy and interest in mathematics, pedagogical beliefs as well as aspects of content and pedagogical content knowledge. The following research questions are addressed: Which emotions and school experiences are related to mathematics in the case of early childhood professionals? How sensitive are early childhood professionals for the mathematical potential in children’s activities in play situations? Are preschool teachers with higher levels of content knowledge more sensitive to the mathematical potential in children’s activities in play situations? How are emotional attitudes, pedagogical beliefs, content knowledge and the sensitivity for the mathematical potential interrelated? The findings point to relatively low levels of content knowledge and pedagogical content knowledge, but they don’t show extremely negative attitudes towards mathematics. The SEM analyses reveal that current joy and interest in mathematics is related with the rated relevance of preschool mathematics as an educational area. The current emotional attitude towards mathematics predicts the level of PCK. It will be further explored if preschool teachers with higher levels of content knowledge are more sensitive to the mathematical potential in children’s activities in play situations. The results underline the importance of emotional aspects as facets of preschool teachers’ professional competence.

Teaching Outside the Classroom. Fostering Learning in Settings of Extended Education

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Over the last two decades, numerous efforts to expand and develop institutional learning opportunities, which supplement (traditional) schooling, have been observed in many countries. In Sweden, for example, the number of places in the leisure-time centers available to 6- to 9-year-olds
outside of regular school hours increased from approximately 25,000 (1975) to 330,000 in 2005. A similar development regarding all-day schools has become apparent in Germany: In the last 10 years, the number of all-day schools has more than doubled. Like school teaching, extracurricular and out-of-school activities are a pedagogical setting (usually) designed by adults, which are (often) supervised by the school or community institution and which are focused on definable, albeit broadly and certainly diverging, learning goals in both the cognitive as well as the psychological and social areas. Extracurricular activities and programs usually differ from classroom learning: In some countries they are not taught by teachers, there is generally no performance assessment using grades, they are often organized in mixed-aged groups, they are usually only subject to a low level of curricular requirements, and they often offer children and youths more freedom of choice. In contrast to the expansion of extended education only little is known about effectiveness, constraints, and challenges of teaching in extracurricular and out-of-school activities compared to classroom learning. The symposium sheds light on this question from an international perspective and based on quantitative as well as on qualitative data. Research presented refers to Swiss and German all-day schools and to Swedish leisure-time centers. These settings are quite different according to their teaching and learning structure so they represent a wide range of settings of extended education.

Professionalism in Swedish leisure-time centres: Teachers’ narratives about their professional role

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The Swedish National Curriculum stipulates that ‘Forms of co-operation between preschool, compulsory school and leisure-time centres should be developed in order to enrich each pupil’s all-round development and learning’ (2011, p. 18). This statement lends itself to generating a number of research questions as the intended type and nature of contribution of these different forms of schooling are largely unknown at the present time. Is there a shared general discourse in the educational traditions providing the basis for leisure-time centre activity? If so, how do teachers in leisure-time centres describe their work and how do they apply their intentions? This study takes its point of departure within a sociocultural framework. The construction of data is carried out by collecting written narratives from 30 teachers, six teachers participating in ‘walk-and-talk-conversations’ and also from two focus interviews. The study is expected to construct knowledge about how teachers in leisure-time centres understand their practice and to describe how their understanding might be construed as belonging to a common discourse. This is likely to be essential description in the complex construction of the foundations of sustainable instruction and learning, keeping in mind that extended learning is the objective of leisure-time centres according to the National Curriculum. This research is also intended as a much-needed contribution to the development of higher education in this emerging field of research. As this is a work in progress analyses will be carried out during the spring of 2013. Preliminary results will, however, be presented at the conference.

Schools Developing their All-Day Program: A Type Analysis

Ariane S. Willems
Today, more than half of the German schools provide extracurricular, all-day programs for their students in order to enrich the school context and enhance teaching. Thus schools increasingly offer additional learning opportunities, which aim at fostering sustainable learning and improving the students’ cognitive, motivational, emotional, and social development. Data on the development of the schools’ all-day curriculum is available through the nationwide, longitudinal evaluation project ‘StEG-Study on the Development of All-Day Schools’ which captures the development of 371 all-day schools in Germany between 2005 and 2009. In this paper, the results of 218 secondary schools are presented. The aims of our analyses are (a) to identify typical patterns of schools regarding the development of their all-day programs, (b) to investigate possible causes for characteristic developmental patterns, and (c) to analyze in how far positive developments sustain over time. Our results indicate that schools characteristically differ during the two years period of broadening their all-day school curriculum: While some schools are able to develop their curriculum substantially over time, others reveal typical areas of stagnation or even declines within their all-day program. Causes for the emergence of unfavorable developmental patterns are e.g. high rates of unresolved starting problems, lacking pedagogical motives and concepts, or a poor cooperation climate of the schools educational staff. Finally, the results show that not all schools were able to sustain their positive development over time and that even schools with negative starting conditions fail to improve over time.

Teaching and learning in extracurricular activities. How they differ compared to classroom teaching

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As the research indicates, all-day schooling in Germany has various positive effects on students, on school culture, family life, and educational infrastructure as a whole. Besides these micro and macro level effects, mostly neglected is the impact of all-day schooling on the meso level, the instructional and pedagogical practice at school. Only little is known for example how to organize teaching and instructional processes in the extracurricular activities at all-day schools effectively. Based on multi-
perspective quantitative and qualitative data from the German Study on The Development of All-Day Schools (StEG) and the theoretical framework of the educational quality of learning contexts developed by Klieme and colleagues (SSCO-model), the contribution examines the question in what way teaching in classroom settings is different from teaching in extracurricular activities. Our findings show that in some ways teaching in both settings is very similar whilst in some areas teaching in both settings is quite different. One of the conclusions that can be drawn from our findings is that it is necessary to implement methods of extracurricular teaching and instruction (at all-day schools) to teacher training.

Multiprofessional collaboration in teaching practices in all-day schools in Switzerland

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Multiprofessional collaboration in settings of extended education has been an important research topic in the past 40 years and has been discussed as a means to improve educational achievement, foster professional development, and support teachers in their everyday work. Several recent studies in multiprofessional settings found that collaboration practices often remain on a student-centered, time-limited, and superficial level of exchange, whereas higher forms of collaboration are very rare (Dizinger, Fussangel, & Büm-Kasper, 2011). Furthermore there exists an obvious research gap on collaboration in Swiss all-day schools (Jutzi & Thomann, 2012). In this study we analyzed practices of multiprofessional collaboration in school-based and community-based extracurricular activities of all-day schools in Switzerland. The aim of this qualitative study of 10 all-day schools was to answer the following questions: (a) What forms of collaboration (informal/formal) are used between the different professionals? and (b) Are there different types of all-day schools with regard to distinctive and consistent types of collaboration? We conducted 18 problem-centered interviews (with the principals/heads of the all-day schools) and 10 focus group discussions (teams). In the process of data evaluation, we applied the method of qualitative content analysis. The results show that multiprofessional collaboration is taking place in all of the all-day schools examined in the study. However, the collaborative practices differ in their level of intensity, design, and purpose.

Learning in Open-Plan School Settings

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While various countries have recently built or re-designed schools with open-plan settings, identifying effective learning processes in these settings remains emergent and under-researched. In this symposium we draw together research insights from complementary studies in three countries,
Australia, Sweden, and England, on enablers and constraints to learning processes to identify challenges and effective implementation strategies, drawing on quantitative and qualitative research methods. On the basis of a survey of 2200 students in these new settings in a regional city in Australia, analyses of their academic performance over three years, and qualitative data of participant teacher perceptions, we propose a framework for conceptualising and enacting effective teaching and learning processes in open plan settings (paper one). We also report on a collaborative study between Australian and Swedish researchers on the use of digitised technologies to support student learning (paper two), and on the role of mutual agency between teachers and students to enhance learning in these settings (paper three). Developing a stronger participatory role for students in self- and peer-assessment of learning is also investigated in the context of team-teaching in an open-plan classroom (paper four). Our symposium is significant in both identifying explicit practical strategies for enacting effective student learning processes across a large cohort of students in these settings, as well as theorising the bases for success of these approaches.

**Learning in Open-plan settings**

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Peter Sellings
Many countries are undertaking school rebuilding programs, often involving open-plan layouts. These layouts afford adaptive curricular practices, although these new settings also represent significant organisational, pedagogical and cultural challenges for both teachers and students. In this paper we aimed to identify enabling conditions for student learning in these settings. We draw on relevant literature on the goals of contemporary schooling to frame analyses of quantitative and qualitative data relating to four Australian new open-plan schools. On the basis of analyses of quantitative data of student academic performance, student transition rates, a survey of students in the old and new settings, and qualitative data of participant teacher perceptions, we propose a framework for conceptualising and enacting effective teaching and learning practices in these new contexts.

**Using digitised technologies for student learning in open plan settings: Sweden and Australia**

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Australia  

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This paper reports on a collaborative research project that (a) identifies factors affecting the utilisation of digital technologies for learning in an open-plan school setting in regional Australia, (b) incorporates European research findings and Swedish analytical expertise in digitised technologies for personalising learning into this analysis, and (c) applies findings from our research on effective use of open-plan settings to use of digitised technologies for learning in Swedish classrooms and other like contexts. A case study approach entailed teacher and student interviews, lesson observations, and artefact and communication analyses. Findings indicate that a range of affordances were provided by the digital technologies that supported student collaboration, engagement in and ownership of the learning process and enhanced student reasoning through collaborating with other students.

**Learning in a flexible space: the interplay of teacher and student agency**

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Although many contemporary schools now feature open classroom layouts, computer technology, and personalised approaches to learning, the question of how best to teach and learn in these contexts remains relatively unresolved. In this paper we aim to identify how agency is characterised and enacted by teachers and students when learning is personalised in these settings. Our case study approach identifies teacher and student reasoning and student reaction to enacting personalised learning in these settings. A model of the mutuality of teacher and student agency is outlined. Key indicators of agency in the model are teacher and student choices about the use of physical and virtual learning space, co-regulation of learning, supporting or enacting autonomous problem solving, and facilitating or using formal and informal strategic networks. Broader Implications are drawn for effective teaching and learning in these contexts.

Personalised Learning in an Open Plan Setting: Student and Teacher Perceptions

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Personalising learning is now advocated broadly in national curricular documents, but poses various challenges for teachers and students. In this paper we report on teacher implementation of this approach in an open-plan setting, where we aimed to identify (a) changes to student perceptions of learning processes, and (b) effects on teachers’ beliefs and practices around effective curricular enactment. We used a case study method incorporating qualitative and quantitative data, focusing on student academic performance and attitudes, and teachers’ views on self directed learning, assessment, transparency and classroom behavior. We found that both students and teachers reported positive perceptions of this learning environment.

Effective Learning Strategies and their Usage in Self-Regulated Training Programs and Computer-Based

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Self-regulated learning is an unmistakenly important aspect in education and this symposium aims to shed light on a variety of instructional design strategies that foster self-regulated learning in various settings. In order to enhance SRL and to support learning, retrieving information provides an important tool. Using adjunct questions to retrieve information within the 3R strategy (read-recite-review) for example, is an effective learning strategy that can be used in an self-regulated learning environment and enhances performance significantly (see abstract of Pauline Reijners and colleagues). The research by Dirkx and colleagues shows that providing questions as a tool to retrieve information fosters not only performance, but also meta-cognitive awareness. Accurate meta-cognitive awareness is also important to effectively regulate one’s own learning. Stebner et al. will present the results of a self-regulation training program in which they taught students cognitive experimentation strategies and additional self-regulation strategies aimed at enhancing the quality of the cognitive strategy use. The symposium will conclude with a model of self-controlled tool selection in computer-based learning environments, which shows that it is important to provide students with advice on tool selection (see abstract of van de Waetere and colleagues). This research is an important addition to the three prior contributions because self-regulated learning increasingly takes place in computer-based learning environments. Briefly, this study sketches the conditions under which tools can be used in such learning environments.

Optimizing the 3R Study Strategy to Learn From Text

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During learning from text, students prefer to take notes or to reread texts. However, research has shown that active retrieval of information leads to better test performance compared to for example rereading a text. Active retrieval can be stimulated by offering tests. The so called testing effect shows that testing can improve performance and long term retention. A possible strategy in the light of the testing effect, which can be used in education, is the 3R study strategy. The strategy consists of three different phases (read, recite, review) and incorporates a testing component. During the recite phase self-testing is applied by the student by for example free recall or cued recall. The results of this phase can be applied during the review phase (reviewing a text passage or the text as a whole). A big advantage of the strategy is that learners can take control during the learning process; they can test themselves. Besides that, the strategy might be appropriate for a lot of tasks and different domains. Until now it is known that the strategy can have positive effects on learning outcomes compared to other popular study strategies, but effects are still small. Therefore the current research project focuses on the effects of offering adjunct questions and aligning cognitive activities required during encoding and retrieving information in order to optimize the 3R study strategy.

The Effects of Testing on Meta-Cognitive Awareness
Although self-regulations is an important aspect of learning, students are poor judges of their own performance. In this study, it was investigated if testing can help to improve judgment accuracy (i.e., bias). Participants either studied an expository text on probability calculations four times, or they studied the text, made a test, restudied the text, and made the same test a second time. The results show that testing leads to less overconfidence and more accurate judgements, both for learning facts and application questions.

**Evaluation of an experimentation in self-regulation training**

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This study examined the effectiveness of an experimenting strategy training in combination with self-regulation in a field setting. 151 fifth graders were randomly assigned to one of three conditions: (1) students were trained to use cognitive strategies; (2) students were additionally trained to self-regulate the quality of their cognitive strategy use; (3) students were trained in reading motivation (control group). Results showed that the self-regulation training group significantly outperformed the cognitive strategy group as well as the control group in strategy knowledge and strategy use.

**Making students instructionally knowledgeable: Advice to support students’ tool selection strategy**
In computer-based open learning environments students have the availability to control the selection of tools in order to support learning. However, learner-controlled tool selection is often suboptimal or even non-existent, which may be due to low or no perceived functionality of tools or to the type of achievement goals that a learner has set. This study highlights the importance of advice as a way to make students instructionally knowledgeable about the functionality of support tools and hence to promote students’ tool selection. Consequently, it is suggested that more optimal tool selection is reflected in higher motivation and higher learning gains. For this study, a computer-based learning environment was used and students were assigned to one of three conditions: (1) no advice on tool selection, (2) cognitive advice on tool selection and (3) affective advice on tool selection. Results indicate that both advice and students’ goals affect the perceived functionality of tools but that a higher perceived functionality is not reflected in intensified tool selection.

**Promoting reading ability and vocabulary. Evidence from recent intervention studies**

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Reading ability is a fundamental prerequisite for educational success and important for academic achievement. Many students lack sufficient proficiency and are subsequently characterized as poor readers. Among others, students with migration background are overrepresented in this group. Therefore interventions and relevant research studies are essential to promote reading ability and to evaluate the effectiveness of different intervention methods. In this symposium, recent intervention studies that examine the effectiveness of different intervention methods to promote reading ability and important prerequisites in primary and secondary education will be presented. Evidence indicates that interventions on different aspects of reading can support students’ reading ability and vocabulary acquisition. The first study investigates the predictive power of phoneme awareness and RAN (Rapid Automatized Naming) on different aspects of reading. The second study examines the potential of the mother tongue for academic vocabulary learning of students with migration background. The third study assesses the effectiveness of a reading comprehension method which targets the promotion of reading engagement of low-achieving students in grade seven. An important requirement for the evaluation of results from intervention studies is the validity of the
tests that have been implemented. The forth study analyzes whether students achieve different performance results in systematically altered formats of diagnostic tests. Implications of the results for educational research and practice will be discussed at the conference in Munich.

**Long-term effects of a randomised reading intervention study: the role of RAN and phoneme awareness**

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Previous research has demonstrated that intensive phonics-linked remedial intervention in a one-to-one setting is effective for word reading accuracy and reading comprehension, whereas reading fluency problems seem to remain (Torgesen, 2005). Most studies have been carried out in English speaking countries, where children learn to read and write in what is characterized as a deep orthography. However, it is often assumed that slow reading is a more pronounced problem among poor readers in more transparent orthographies (Wimmer, 1993), and RAN is suggested to be a better predictor of reading fluency than phoneme awareness (Landerl & Wimmer, 2008). A Swedish multi-component intervention program has been developed and implemented in a randomised intervention study for 9-year olds. The intervention group (n=58) received 40 minutes of one-to-one instruction per day for twelve weeks. The control group (n=55) took part in ordinary classroom activities. Structured equation modeling was used to examine relations between the latent variables phoneme awareness, reading speed, reading comprehension, spelling, RAN and non-verbal cognitive skills between groups and over time. Results show that significant gains in both reading speed and accuracy can be achieved by intensive phonics-linked instruction in combination with repeated reading. Furthermore, results show that RAN influences reading speed, whereas phoneme awareness influences reading comprehension and spelling.

**The potential of the mother tongue for academic vocabulary learning in German**

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Annika Ohle  
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Recent studies suggest that deficits in language skills contribute to performance differences between students with and without migration background in terms of academic achievement. Possessing an elaborated vocabulary, which is a necessary requirement for developing language skills, is essential for successful learning processes and outcomes. Research has shown that students with migration background are especially challenged by academic language and have a need for support in this area. The present investigation is concerned with this fundamental issue for educational research and practice. Two intervention studies based on the Theory of Learning from Context will be presented that examine the potential of the mother tongue for vocabulary learning in academic German. In these interventions with experimental designs, learners read texts with unfamiliar vocabulary either twice in German or first in their mother tongue and then in German. Analyses of the first intervention study in grade 4 (N = 62) show that the method of learning unfamiliar vocabulary from
context is effective for students with migration background. Nevertheless, the inclusion of the mother tongue does not affect vocabulary learning for students with migration background. The second study evaluates these results in an extended intervention of 20 sessions integrated in classroom instruction and with a larger sample. Results of both studies will be presented and implications for research and educational practice discussed at the conference.

**Does promoting reading engagement foster low achieving adolescents’ reading ability?**

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Many students in secondary education struggle with reading tasks in schools. Their reading problems are assumed to be partly due to a lack in reading engagement. Reading engagement can be defined as being socially interactive, strategic and motivated. In this study, the effectiveness of a reading comprehension method, that aims to promote reading engagement, is tested in a sample of low achieving adolescents. The two-year intervention (of which year 1 is reported) consisted of strategy instruction, motivating contexts and reciprocal teaching. A total of 20 classes with their teachers participated in this study, which were randomly assigned to either the intervention or the control condition. Results of multi-level analyses revealed no significant main effect for the intervention. However, some support was found for a hypothesized interaction between strategy instruction and participation in the intervention. This effect implied that for students in the intervention condition strategy instruction positively affected reading comprehension, while it did not for students in the control condition. Furthermore, observational data from the lessons showed intervention teachers scored higher on strategy instruction and supporting group work compared to the control teachers. They did not differ in the use of modeling. Possible explanations for the results are that the intervention has not been optimally applied by the teachers and that students need time to adjust to the new method as well.

**Vocabulary of Students with Different Family Languages: Test Formats and Differences in Languages**

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Miriam Marleen Gebauer
The acquisition of the school language is of central importance both for academic success and participation in today’s society. Students’ vocabulary has been identified as an important prerequisite for reading (Muter et al., 2004) which in turn is a key competence for learning in most subjects at school and, thus, for educational success (NICHD, 2000). Based on the Theory of Learning from Context (Sternberg & Powell, 1983) - the meaning of unknown vocabulary can be deduced from the context provided, it is assumed that the presentation of words with or without context in vocabulary tests can lead to differences in test performance. Testing formats could have a particularly strong effect on children with low vocabulary skills like students with another home language than the school language. A further research interest was to examine students’ vocabulary skills in Turkish and German at the end of elementary school taking into account the differentiation between academic and everyday language skills. The results (N = 293; grade 4) show that performance in academic vocabulary tests depends on testing format, family language and reading comprehension. Students with Turkish family language performed similar in the academic vocabulary test in Turkish and German, while slight differences in everyday vocabulary favoring German skills were found. The implications of the research results for educational research and practice will be discussed.

**Argumentation theories and the Learning Sciences – Part 2: Critical Argumentation**

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In the wake of research on socio-cognitive conflict and ‘critical thinking’ pedagogy, researchers have searched for the constructive and productive processes at work in argumentative interactions between learners (see Andriessen & Coirier, 1999; Andriessen, Baker & Suthers, 2003; Muller Mirza & Perret-Clermont, 2009). However, such research has suffered from a major obstacle, towards whose remediation this symposium aims to contribute: there has been an insufficient degree of appropriation of theories and models of argumentation in research on learning to argue and arguing to learn, carried out in the Learning Sciences. The research field of ‘Argumentation Studies’ is represented by the journal ‘Argumentation’, and the International Society for the Study of Argumentation conferences (see also van Eemeren, Grootendorst and Snoeck Henkemans, 1996). Monological theories (e.g. Toulmin,1959) have received more attention in education than dialogical theories, proposed by F.H. van Eemeren, and by D. Walton. This symposium is organised around the research of one of the most eminent contemporary argumentation theorists, Prof. Douglas Walton (informal logic and critical argumentation; University of Windsor, Canada). It is a continuation of the proposed EARLI 2013 symposium ‘Argumentation theories and the Learning Sciences, Part 1: pragma-dialectics’, organised by Prof. Baruch Schwarz (Hebrew University, Jerusalem).

**Knowledge and Explanation in Educational Dialogue**

Douglas Walton
This paper provides an abstract model of educational dialogue based on recent research in argumentation studies and artificial intelligence. A dialogue is defined as an ordered 3-tuple \( \{O, A, C\} \) where \( O \) is the opening stage, \( A \) is the argumentation stage, and \( C \) is the closing stage. Dialogue rules define what types of moves are allowed. At the opening stage, the participants agree to take part in some type of dialogue that has a collective goal. Educational dialogue centrally involves a transfer of knowledge from one party to another. It also involves the typical situation where one party tries to explain something to another (sometimes successfully). Hence the paper takes a dialogue approach to knowledge and explanation that is different from the traditional theories of knowledge and explanation in analytical philosophy.

**Arguing to Learn**

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Netherlands

In this contribution I argue that approaches from learning sciences or from pragmatic linguistics will only meet if they would arrive at sharing norms for evaluating collaborative argumentation in practice. This is currently not the case, for either side.

**Argumentation in a Changing Climate: Walton’s Dialogue Theory and Teaching About Climate Change**

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Walton’s dialogue theory is a conceptual framework for analyzing arguments that involves identifying argument schemes (i.e., types of arguments) and asking critical, evaluative questions attached to particular schemes. This presentation will report on two efforts to use dialogue theory to teach about global climate change. The first is a study conducted in three 7th-grade middle-school classrooms where students argued about the merits of a carbon-tax. Students at this level were able to understand the concept of critical questions and to use some of these questions productively. The second was a graduate seminar on reasoning in which students evaluated the evidence for human-induced climate change. A number of argument schemes were identified by students (e.g., correlation to cause) and asking critical question led to additional insights on this issue. Although there are still unanswered questions about how best to teach dialogue theory, teaching students to ask the critical questions specified in dialogue theory appears to be a promising approach for enhancing critical thinking and learning about complex issues such as climate change.

**Revisiting educational dialogues in their complexity: tracing their goals, deployment & productivity**

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Walton has identified distinctive goals of argumentative dialogues to propose his well known typology which includes educational dialogues as a separate category. As a result of dramatic changes in education argumentation has become a central goal for teaching and learning. The goals of educational dialogues pertaining to argumentation are then to be revisited. In particular, collaborative construction of arguments and dialectical argumentation introduce new goals in the educational scene. Scrutiny over these dialogues shows that, in contrast with argumentative dialogues outside of education, we should distinguish between the goals of dialogue as a description (based on features from the actual dialogue), as a prescription (the instructions for dialogue given by the teacher) and as an individual intention (the individual motivations and expectations of discussants prior to actually engaging in the dialogue). This complex picture conveys the unique characteristics of educational dialogues in which the teacher and the students try to impact the nature of the dialogue for diverse reasons.

Cognitive Development

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Both deductive and inductive reasoning competencies are foundational for the acquisition of mathematical and scientific knowledge. While developmental psychology has highlighted early competencies, in preschool age, under very simplified task conditions, there is ample evidence for conceptual and processing difficulties in tasks with higher curricular validity both in elementary and in secondary school age. The present symposium brings together research on inductive inference from covariation data and research on deductive inference in mathematical proof and in the learning of algebraic principles. The papers address the sources of students’ difficulties by contrasting formal (mathematical) and contextualized task conditions, by varying the role of prior knowledge, presentation mode, and format of contingency tables, by analyzing students’ performance in different proof types, and by varying instructional conditions, such as self-learning vs. direct instruction. Implications of the findings for the teaching and learning of algebra, mathematical proof, and stochastics, as well as for science education will be discussed.

Type of Mathematical Proof: A Possible Predictor of Performance Development?

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Switzerland
This contribution examines, using the data set of the project ‘Instructional dialogues and learning outcomes in problem-oriented mathematics teaching’, to what extent associations can be described between different proof types and class performance. We systematically analyse the videotaped work on an inner-mathematical proof problem of 32 8th-9th-grade classes and relate them to students’ performance data. Results indicate that the classes’ starting conditions differ according to proof type performed, and the work can be seen in the broadest sense as adaptive. Equally, there are associations between the observed proof types and the learner’s performance development.

**Direct instruction outperforms self-learning: An introduction in algebraic term transformation**

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Self-learning methods are widely accepted in education communities and many teachers rebuild their teaching to more self-learning activities. However, there is increasing evidence for substantial effects of direct instruction. Two experiments investigated the effects of a contrasted compared to a sequential introduction to algebraic term transformation. In the first experiment, 80 sixth-graders processed a self-learning program with worked-examples and self-explanation questions that prompted students to extract the algebraic principles by themselves. In the second experiment, 85 sixth-graders were given an introduction at the blackboard by the teacher who guided the deriving of the algebraic principles by highlighting the important points. There were four 2-hours sessions with a total of 9 units. After each unit, the students solved a certain amount of trial tasks. There were advantages of direct instruction for explicit conceptual understanding in the short and medium term one day and one week later, however no longer ten weeks later. The teachers’ explanations of principles in direct instruction may help to store the information better. For the ability to solve term transformation problems, we could not show advantages of direct instruction, but neither any negative effect. The means in the short and medium term went rather in direction of a benefit for the direct instruction method.

**Inductive Reasoning at Elementary School Age – the Influence of Context Domains on Covariation Tasks**

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Petra Barchfeld  
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Germany
Inductive reasoning is not only essential for everyday life thinking processes but also in science, where inductive inferences are drawn from patterns of data. The development of the ability to evaluate scientific evidence has not been studied in depth. Previous research has shown that on the one hand preschoolers already have some basic understanding of covariation data, but on the other hand that adolescents perform poorly in tasks that require intuitive statistical analysis. Effects of context domains on children’s performance in data evaluation have not been examined specifically. Results from other fields indicated a facilitating effect of everyday contexts in comparison to abstract ones. The present study aims to examine the effects of context domains on the interpretation of covariation data presented in 2x2 contingency tables. Therefore, two contexts with an everyday cover story as well as two abstract contexts were addressed in a between subject design. The analysis indicated variation in difficulty between the two everyday context conditions, but neither one was significantly easier than the abstract context conditions. On the contrary, one everyday context condition caused poorer performance than one of the abstract contexts. Previous studies supported the claim that an everyday context fosters correct inductive reasoning. In contrast to these findings, our results indicate that a connection to everyday life can influence the performance negatively.

Elementary School Children’s Inductive Reasoning in the Evaluation of Contingency Tables

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The ability to evaluate covariation data is not explicitly addressed in the elementary school curriculum. Although preschool children can infer causality from perfect covariation between two variables, deficits in reasoning from more complex patterns of imperfect covariation persist into adulthood. In the present study, we address the evaluation of contingency tables under conditions which might facilitate the process for elementary school children. A series of nine 2x2 contingency
tables were presented to 4th graders in different contexts under facilitating task conditions. Results show that childrens judgments were hardly influenced by the format of data representation but rather by instruction condition, subjective beliefs, and sequential data presentation. Findings are discussed with regard to the underlying cognitive processes.

When to Use and How to Optimise Instructional Explanations

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Instructional explanations are commonly used. However, they often have minimal or even detrimental effects on learning outcomes. This failure of explanations might partly be due to three major problems: (1) explanations on certain aspects of the learning material yield an illusion of understanding which prevents learners from engaging in active processing of subsequent aspects, (2) the design of the explanations does not correspond to learners’ needs and learning goals, and (3) learners do not deeply process the explanations. Against this background, the aim of this symposium is to explore when explanations should be used and how learning from explanations can be optimised. All contributions address this aim in experimental studies. Contribution 1 relates to the first problem and explores whether explanations about the problem formulation of worked examples have detrimental effects on processing subsequent aspects of the examples. Contribution 2 relates to the second problem and analyses whether and how design-features of explanations (i.e., generality and coherence) affect learning outcomes. Contributions 3 and 4 relate to the third problem and explore instructional means to foster deep processing, that is, warning messages prior to providing explanations (Contribution 3) and withholding some information from explanations and prompting learners to infer the withheld information on their own (Contribution 4). The findings of all contributions conduct to a better understanding of when and how to use explanations more skilfully because they (a) show that under specific conditions explanations can be detrimental, and (b) provide new insight into instructional approaches to optimise learning from explanations.

Too Much Explanation Impairs Example-Based Learning

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To fully exploit the potential of example-based learning, it is necessary that learners engage in explaining the worked examples. Usually, engaging in explanation is confined to the solution steps of worked examples. Therefore, an unanswered question is whether engaging in explaining the problem formulation of worked examples, in addition to the solution steps of worked examples, influences learning. Although engaging in explaining the problem formulation of worked examples has the
potential to support the construction of problem representations, it might also produce an illusion of understanding that inhibits further self-explanation activities. In an experiment, N = 63 learners all self-explained the solution steps of worked examples. However, the learners differed in how they processed the problem formulation of the worked examples because they generated self-explanations, read instructional explanations, or received no assistance. The results showed that explaining the problem formulation of the worked examples increased the time for processing the problem formulations, reduced the time for processing the solution steps, decreased the number of principle-based explanations about the solution steps, and impaired transfer performance. This detrimental effect was more pronounced for learners who generated self-explanations than for learners who read instructional explanations. The findings suggest that generating or reading explanations about the problem formulation prevents learners from actively processing the solution steps of worked examples. Thus, explanations added to the problem formulation of a worked example are not only time-consuming but also indirectly detrimental to learning.

Characteristics of Explanations: Coherence Fosters Transfer - Generality Fosters Integration

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As research has shown, instructional explanations, as a prevalent means of instruction, are often not designed in a way to engage novices’ meaningful learning. However, the efficacy of instructional explanations can be enhanced by concentrating on essential textual characteristics that enable novices’ meaningful learning. However, no study has yet directly examined how different text characteristics accounted for the quality of novices’ knowledge acquisition. Therefore, we compared explanations by medical domain experts with at least 15 years of working experience with explanations by intermediate students in their fifth year of studying that varied in their levels of generality and coherence. Using an incomplete 2 x 3 factorial design, we asked 69 novices in their first year of studying to study these instructional explanations. After studying the explanations, novices answered a conceptual knowledge test measuring their conceptual understanding and a transfer test measuring their flexibility of knowledge. Contrast analyses indicated a differential effect. Whereas generality mainly accounted for novices’ acquisition of conceptual knowledge, coherence mainly supported novices’ transfer of knowledge. Thus, highly coherent explanations better fostered novices’ transfer compared with low coherent explanations. Contrary to our assumptions, novices with high-general and low-general explanations outperformed novices with medium-general explanations on the conceptual knowledge test. The results suggest that concentrating on certain characteristics of explanations could induce novices’ acquisition of different qualities of knowledge. For fostering novices’ conceptual understanding, instructors should rely on high-general as well as low-general explanations, whereas for acquiring flexible knowledge, highly coherent instructional explanations seem to be a beneficial strategy.

Warning Messages to Make Instructional Explanations Effective: How Do They Work?

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Instructional explanations that address learners’ understandings are not always effective. Learners benefit from these explanations when they are aware of their misunderstandings, which can be elicited by warning messages (corrective feedback after adjunct questions). In prior experiments we found that revising instructional explanations combined with warning messages are more effective than instructional explanations alone. Here we explored if warning messages alone can also promote deep learning and how learners react to warning messages. Participants learned about plate tectonics from a multimedia presentation that included either instructional explanations, instructional explanation plus warning messages, warning messages alone, or no support devices. Participants receiving explanations combined with warning messages outperformed those in the other conditions. Participants receiving warning messages alone did not differ from those in the control condition. Within the condition with both warning messages and explanations, passing or failing the adjunct questions made no difference. Within the condition with warning messages alone, passing or failing the questions made no difference either.

How to Foster Learning From Explanations by Explaining Less

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Although explanations are commonly used to introduce learners to new contents, previous studies have often shown that their effects on learning outcomes are minimal. This failure might partly be due to shallow processing on part of the learners. One means to foster deep processing of explanations could be to withhold some of the information included in the explanations and to prompt learners to infer the withheld information on their own. The cost of such incomplete explanations, however, might be the production of errors which may hinder learning. Therefore, it is uncertain whether providing learners with incomplete explanations and inference prompts fosters learning as compared to providing complete explanations. Additionally, it is unclear whether giving remedial explanations which include the withheld information to learners who have difficulties inferring it is a beneficial add-on to incomplete explanations and prompts and whether prompting learners to use the remedial explanations to overcome their difficulties would have an added value. Against this background, in an experimental study N = 83 high school students either received (a) complete explanations about chemistry, or (b) incomplete explanations with inference prompts, or (c) incomplete explanations with inference prompts plus adapted remedial explanations, or (d) incomplete explanation with inference prompts plus adapted remedial explanations with repair prompts. As main findings, we found that learners who received incomplete explanations and inference prompts learned more than learners who received complete explanations. Furthermore, we found that remedial explanations had beneficial effects on learning outcomes, but only if they were combined with repair prompts.

Social and Interactive Aspects of Learning and Instruction

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Italy

Hermann J. Abs
The question of whether conditions at school influence competences and attitudes about citizenship is a contested issue. In light of new international datasets, the relevance of various aspects of schooling to various citizenship outcomes will be analyzed in the symposium. The aspects of schooling we will look into are for instance the early streaming of students according to their general cognitive ability, the tracking of students into vocational and general schools, perceived social tensions, and the perceived equality of opportunity within the school system. As outcome measures we will examine civic knowledge, intentions for citizenship engagement, and voting, as well as various ideals of the good citizen. The aim of the symposium as a whole is to discuss how the IEA-ICCS study scheduled for 2016 can be improved upon so it will deliver even more knowledge on the malleable aspects of schooling and school systems that influence citizenship competences.

The measurement and influence of social context on civic outcomes in ICCS 2009

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ICCS 2009 studies the ways in which different education systems prepare young people for their role as future citizens and compared measures of civic knowledge and engagement across 38 countries. The conceptual framework for this study also assumed that civic-related learning outcomes are influenced by factors located at different level (student context, home environment, school context and the wider community) and collected data at different levels about the social context in which students learn about civic-related outcomes. This paper will describe how variables related to the social context were measured through contextual student, teacher and school questionnaires and how they influence the variation in students’ civic knowledge test results and expected electoral participation. It will combine indicators of students’ social background related to immigration, home resources and parental influences with factors that are aggregated and/or collected at the level of schools (e.g. principals’ and teachers’ perceptions of school and community). The effect of social context will be investigated using multi-level analyses. Results have shown that in particular socio-economic background factors have considerable effects on the variation of civic knowledge whereas indicators of engagement are more influenced by parental interest in and communication with children on political and social issues. At the level of schools analyses show bivariate associations between the availability of community resources and student civic knowledge whereas occurrences of social tension in the community tend to have negative effects.

Educational differentiation and inequalities of civic engagement

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This presentation explores whether two dimensions of education system differentiation, namely degree of grouping by ability and degree of school autonomy, are linked to inequalities of civic engagement across schools and across social and ethnic groups. Use is made of the ICCS 2009 data set, a study among 140,000 Grade 8 students in 38 countries. Civic engagement is tapped with six indicators: civic knowledge, political efficacy, intention to vote, institutional trust, gender equality and ethnic tolerance. Grouping by ability is measured with a construct combining data on age of first selection with data on the percentage of schools without any grouping by ability. School autonomy is measured with data on autonomy in curriculum planning, the delivery of the curriculum and the choice and use of textbooks. We find that grouping by ability only leads to greater differences across schools in civic knowledge and intention to vote. It is not linked to greater inequalities in any of the other indicators of civic engagement, neither across schools nor across social groups. School autonomy is not related to any inequalities of civic engagement. Four possible reasons are offered for these non-relationships: (1) insufficient relevant curriculum content until the age of 15, (2) lack of receptivity to relevant curriculum content among 14 year olds, (3) lack of awareness of exclusionary processes among school students and (4) diverging cultures and identities of different social groups.

Effects of vocational vs. general education on political outcomes in Denmark, England and Germany

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This paper explores the effects of school selection on students voting intentions in England, Denmark and Germany. The results suggest that there are a number of complementary explanations. First, lower levels of Social Economic Status (SES) lead to both a greater likelihood for young people to be in Initial Vocational Education and Training (IVET), and that these young people have lower levels of political self-efficacy. In addition, political self-efficacy and track both then mediate between SES and intention to vote, in the sense that lower levels of political self-efficacy and the IVET track further reduce the likelihood of disadvantaged students to vote. Furthermore, the experience of IVET can have a direct effect on voting intentions possibly through socialisation of the predominant SES group in the school track. Finally, the country context creates different effects. Where IVET has a higher status the effects of IVET on voting intentions appear to be reduced. Where school streaming is the norm and IVET has low prestige, there is the strongest effect of SES on IVET, and the strongest direct effect of IVET on voting.

Perception of equal opportunity within the school system and students’ concepts of good citizenship

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To reflect students’ attitudes towards citizenship, the IEA International Civic and Citizenship Education Study (ICCS) covers agreement with statements regarding the ‘good citizen’ as a normative concept. The items used in the study until now have resembled the ideal of a participatory citizen. However, including items on four competitive democratic theories will broaden and differentiate the understanding of good citizenship. The new scale shows four dimensions in the understanding of good citizenship: liberal, communitarian, republican, and critical. The scale first was tested on 901 students in Germany. Confirmatory Factor Analysis showed the new scale to have a good fit. The four dimensions have been correlated to a small to medium degree; most strongly the liberal understanding of good citizenship was distinguished from the other concepts. In the presentation there will be greater analysis of the extent to which students’ perceptions of equal opportunity in the
school system influence their understanding of good citizenship. Here the results showed clearly that liberal and critical understanding are influenced much more by perceived inequality than the communitarian and republican models. Further options for improving the scale and the relevance of the results to the development of citizenship education will be discussed.

**Computer-Supported Collaborative Learning (CSCL): Exploring Synergetic Scaffolding and Scripting**

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Main approaches to scaffolding in CSCL (e.g., scripting) are focusing on how technology can be designed to guide learners through complex problems and inquiry tasks, and on how peer learners can support each other’s learning in small groups (Morris et al., 2010). Recently, there have been efforts to study scaffolding and scripting in real CSCL classrooms. In classroom situations a teacher plays a central role in guiding learners by using different types of scaffolds. Moreover, groups are part of a class and sometimes even of a wider learning community transcending the individual classroom. There is hence a need to extend these scaffolding and scripting approaches. They need to address the interplay of different types of scaffolding like domain support and interaction support, of different sources of scaffolding (teachers, peers, technology), and of different social levels that scaffolding can be targeted at (individual, small group, class, collective) (Dillenbourg et al., 2009). This symposium brings together researchers working on these relatively new issues. The papers by Vogel et al. and by Weinberger et al. investigate the interplay of collaborations scripts with forms of domain-specific support. The papers by Slotta et al. and by Raes & Schellens explore potential synergies of different scaffolding sources (teachers, peers, technology). Whereas all four papers consider multiple social levels in scaffolding, Slotta et al. additionally pioneer through conceptualization of the collective level. Based on the four presentations, Nikol Rummel as the discussant will derive more general insights and identify promising lines of research on synergetic scaffolding and scripting.

**In search of a synergy between multilevel scaffolding of web-based inquiry in complex classrooms**

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In line with the advent of computer-supported collaborative learning in authentic classroom practices, we also face the challenge to rethink the notion of scaffolding from a multilevel approach. Three external sources of scaffolding can be identified, i.e. technology, peers, and the teacher. Although distributed scaffolding with multiple modes of support with each its own unique affordances is put forth as an approach to support learning in complex classrooms (McNeill & Krajcik, 2009; Tabak, 2004), research that explores everyday classroom interactions between these multiple modes of scaffolding is limited. This paper presents empirical results obtained through a design-based research project including four intervention studies in secondary science education. To get insight into the synergy between multilevel scaffolding in CSCL classrooms and students’ need for scaffolding, a Web-based collaborative inquiry learning project has been implemented in 12 authentic secondary science classrooms on a yearly base to improve knowledge integration and metacognitive awareness with respect to Information Problem Solving on the Web. Our findings support the notion of multiple scaffolding as an approach to enhance both knowledge integration and metacognitive awareness and to differentiate between students with different needs within the context of a web-based inquiry learning project. The results of a third iteration focusing on the role of the teacher to orchestrate the scaffolding process will be presented at the conference.

Knowledge Community and Inquiry: Scaffolding individual, collaborative, and collective activities

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This paper advances Knowledge Community and Inquiry (KCI) as a pedagogical model that guides the design of complex, sustained inquiry curriculum that includes individual, collaborative (i.e., small group) and collective (whole class) activities. This presentation will describe the KCI model and several research studies that resulted in a set of design principles that guide the creation the inquiry activities and scaffolds. It will also present learning outcomes from each of the curriculum studies. Outcomes from a 2 year study where the KCI model informed the design of a high school science curriculum will be reviewed and synthesized into findings related to a set of design principles that serve to refine KCI and inform the development of further curriculum. Teachers and researchers collaborated closely in developing a 12-week Global Climate Change curriculum that was enacted by 5 class sections (n=124) of 9th grade (age 14 years) science students. A sophisticated technology environment was developed to scaffold students within and between inquiry activities that occurred in a complex modified jigsaw sequence. This was a design-oriented study, in the sense that the goal was to investigate the KCI model by creating a curriculum according to its principled assertions, and to obtain some measure of the efficacy of the model in terms of producing or evoking the targeted set of interactions. In addition to student learning gains, KCI may be evaluated according to a set of pedagogical design principles which can themselves be tested against observed interactions and outcomes of the enacted curriculum.

Is there a synergy of domain-specific and collaboration support in fostering argumentation skills?

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Collaboration scripts and heuristic worked examples seem to be promising ways of instructional support to foster students’ acquisition of argumentation skills in mathematics. Thus, a project was conducted that applied both means of instructional support in mathematics education with the aim to reach synergistic scaffolding (i.e. effects that go beyond an addition of the single effects of both means of instructional support, Tabak, 2004). Earlier results of the project (Kollar, et al. 2012) have shown that both means of instructional support could enhance students’ acquisition of argumentation skills in a computer-supported collaborative learning environment in the context of mathematical proof tasks. This paper is concerned with the question if transactive argumentation as beneficial learning process can be induced by both means of instructional support and to what extent transactive argumentation mediates the effects of collaboration scripts and heuristic worked examples on learning outcomes. We present process measures from a 2-factorial experiment with the factors collaboration script (with vs. without) and heuristic worked examples (with vs. without) conducted with N = 101 first semester pre-service math teacher students. Results show that both means of instructional support induce transactive argumentation in the collaborative learning process in a synergistic way. Further, the self-generated transactive argumentation and not the transactive argumentation generated by the learning partner (partner-generated) mediates the effectiveness of the collaboration script and the domain-specific instructional support during on the acquisition of argumentation skills.

Supporting Discussions through Argument Diagrams and Collaboration Scripts

A considerable focus in online learning has been placed on promoting high-quality forms of argumentation with different instructional approaches. In the knowledge representation approach, students create external knowledge representations, such as argument diagrams, to classify and organize relevant domain knowledge in a systematic way. In the scripting approach, students communicate through a structured communication interface that enforces or encourages a desired mode of communication. Each approach typically provides support on a different level: Knowledge
representations provide a structuring on the epistemic level (i.e., relevant knowledge and relations) while scripts provide a structuring on the social level (i.e., fruitful discussion moves and interactions). Since the generation of high-quality discussion moves requires both, appropriate use of domain knowledge and appropriate forms of social interaction, we hypothesize that the combination of argument diagramming and a scripted interface can have synergistic effects in promoting high-quality argumentation. In a control group design (N = 44) we compare students in an argument-diagramming environment with versus without a script. Results show that scripting could additionally enhance argumentative quality of the discussions, but did not improve learning outcomes.

**Regulation of Learning and Motivation in Comprehensive Reading**

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Comprehensive reading is a key subject in primary education. In order to comprehend written texts, students not only need decoding skills, they also need to regulate the use of learning strategies. Furthermore, students need to regulate their motivation for reading in and out of school contexts. Up to date, there are several studies showing that regulation of learning and motivation is related to comprehensive reading performance. However, more research is needed to study how the different aspects of regulation and cognition are related and which variables influence these relationships. Moreover, training studies are needed in which the assumed relationships are experimentally studied. This symposium aims to provide an overview of studies addressing regulation of learning and motivation from these different angles. In the first submission, students’ ability to visualise text while reading is assessed for girls and boys. Visualization is supposed to help students to regulate their reading and to monitor their text comprehension. In the second submission another aspect of regulation, namely primary school students’ regulation of motivation, is assessed in a longitudinal study. This study addresses the issue whether different types of regulation of motivation (autonomous versus controlled) influence reading behaviour and performance. In the last two submissions, the theory about regulation of comprehensive reading is put into practice with two experimental studies. Both studies use a computer environment in which students’ regulation of learning strategies is supported while reading texts. The two studies lend interesting initial support for the trainability of such skills in educational settings.

**Individual Differences Moderate Perceptual Simulations during Language Comprehension**

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Constructing a visuo-spatial mental representation of the events described in a text (i.e., situation model) helps readers to remember and understand stories, and to regulate their comprehension processes. From an embodied account of language processing, both children and adults create perceptual simulations of the events they read about. This study is the first to investigate whether individual differences in spatial abilities and gender influence readers’ construction of perceptual simulations. Primary school children (Grade 4-6) performed a sentence-picture verification task. Children read sentences implicitly suggesting a particular shape for an object, and decided whether a subsequently presented pictured object was mentioned in the preceding sentence. Critically, the object depicted in the picture either matched or mismatched the shape suggested in the preceding sentence. Children’s spatial abilities were measured with a mental rotation task, requiring them to choose which rotated figure corresponded to the original figure. Results showed that responses were faster for matching than for mismatching pictures, suggesting that children had formed perceptual simulations of the (shapes suggested by) sentences. However, this difference was significantly higher in girls than in boys, indicating that girls are better able to visualize text. Nevertheless, boys showed higher spatial abilities on the mental rotation task. Together, this suggests that although boys have better spatial abilities, they can use these abilities insufficiently in linguistic tasks such as reading. Taking into account gender and visuo-spatial abilities is therefore important when teaching children a visualization strategy to understand text and to regulate their comprehension processes.

Autonomous and controlled reading motivation as predictors of reading behaviour and performance

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The aim of the present study was to examine how late primary school students’ autonomous and controlled reading motivation contributes to their reading behaviour (i.e., reading frequency and engagement) and performance (i.e., comprehension) in a longitudinal study, since prior research was particularly cross-sectional and thus unable to test for the directions of effects. In addition, reading behaviour was examined as a mediator between reading motivation and comprehension, given that reading frequency and engagement have received mixed evidence as mediators in prior study. To pursue this aim, a longitudinal study (i.e., three measurement occasions) was set up. Participants included 458 fifth-grade primary school students (i.e., on average 10.5 years old). Path analyses
indicated that recreational and academic autonomous reading motivation predicted higher leisure-time reading frequency and better reading comprehension as compared to controlled reading motivation. Interestingly, recreational and academic controlled reading motivation did not affect reading engagement and even yielded a significantly negative association with reading comprehension. This underlines the significance of distinguishing qualitatively different types of reading motivation (i.e., autonomous and controlled reading motivation). As for the mediation of the relationship between reading motivation and comprehension through reading behaviour, no evidence was found for reading frequency as a mediator between reading motivation and comprehension. In contrast, reading engagement mediated the relationship between recreational autonomous reading motivation and reading comprehension. This suggests that especially the emotional and behavioural quality of students’ reading behaviour (i.e., engagement) rather than its quantity (i.e., frequency) is important in enhancing students’ reading comprehension.

**Question Oriented Training of Comprehensive Reading**

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Comprehensive reading is a key subject in primary education. Students’ comprehension of what they read is mostly evaluated by using questions about texts. When answering comprehensive reading questions, proficient students typically use metacognition to regulate the application of reading strategies depending on the question at hand. However, most comprehensive readers were found to use reading strategies in an unstructured and rather inefficient manner. In line with this finding, a computer program is developed which provides students with metacognitive hints to help them to determine the content of questions, and to consequently choose an appropriate reading strategy. The effectiveness of this program is studied by means of an experiment in grade 5 with an experimental group of students working with the computer program with hints (n = 62) and a control group working with the same questions without hints (n = 62). Students individually worked with the program for 18 lessons. Results show that the intervention has a main effect on the trained skill, namely ability to recognize question types. However, effects on comprehensive reading performance are yet unclear. Explorative analyses give a first indication that effectiveness of the program may be affected by how well students were able to apply the question-oriented approach.

**Teaching Reading Literacy Self-Regulation Strategies with TuinLEC: an Intelligent Tutoring System**

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This paper reports on two experiments where high school students received training with different versions of TuinLEC, an intelligent tutoring system designed to improve students’ reading literacy skills to self-regulate how to read a document to answer different types of questions. In the first experiment, a sample of sixth-graders pretested on reading comprehension were randomly assigned to either the experimental or the control group. Children from the experimental group where trained...
with a version of TuinLEC that included two phases, Explicit Teaching and Practice plus adaptive feedback. In the Explicit Teaching phase, virtual animated agents taught children metacognitive strategies to read texts and answer questions, and they guide their practice, whereas in the Practice phase, children simply practiced those strategies getting adaptive feedback on their behaviour. Results showed that students in the experimental group significantly outperformed those in the control group on a reading literacy test completed after training. The second experiment aims at investigating whether students’ learning gains found in the first study were due to either the modelling and guided practice provided by the virtual agents in the Explicit Teaching phase or to the students’ practice plus the adaptive feedback when performing the reading and answering questions tasks. Students from sixth- and eighth-grade were trained with the complete version of TuinLEC as in study 1, or with TuinLEC-Practice, a version that only included practice plus adaptive feedback. Preliminary results showed that students from sixth-grade benefited from the complete version, whereas no differences were found for eight-grade students.

**Teachers’ Use of ICT in Higher Education: Evaluation of Moodle as a Learning Management System (LMS)**

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Moodle, as a Learning Management System (LMS), offers useful virtual resources that complement face-to-face teaching in higher education. It allows using graphs, websites, video-broadcasting, and Java and ActiveX technologies as a support for Educational courses encouraging the emergence of more sophisticated knowledge and the development of communities of learning. However, this worldwide resource is often used as a repository and not as the interactive environment that has been extensively promoted. The present work describes how this platform is used at a Spanish University. A sample of 392 undergraduate students replied to a 20-item Likert type questionnaire and three additional open-ended questions on the advantages, limitations and enhancements of the tool. Besides, statistical differences (i.e. chi-square) between ICT teaching courses and non-ICT courses were scrutinized. A mixed method approach was employed: correlational and descriptive statistics were calculated for three dimensions of the questionnaire (content management, evaluation and interactivity) and topical analysis for the open-ended questions. The main results indicate that students valued highly the use of Moodle by their teachers, although there were significant differences between the two groups in the dimensions of contents and evaluation (ICT courses were rated highly), but not in interactivity. Those outcomes, besides a detailed category of Moodle uses from the topical analysis, shed light on how this tool can be improved as a way of favouring its didactic value (i.e. collaborative learning) as opposed to the technical use of it that has been predominant so far (i.e. repository of contents).

**Assessment of learning to learn in early school years**
The traditional research on learning to learn focused on two dimensions, the cognitive and the social cultural. Further research emphasised that learning to learn also contains metacognitive elements, for this reason the metacognitive perspective has to be considered as well. In the present paper we connected the cognitive and affective dimensions. In the cognitive field we examine the level of knowledge of Years 1 and 6. Moreover, in the affective field we gather questionnaire data about students’ leaning characteristics. We compare the results of the Years, draw conclusions of the affective characteristics and analyse the role of cognitive and affective factors at play in the Year 1-6 achievement. We are looking for relationships between cognitive fields, learning and school related affective factors in the sample, moreover, we investigate how these can be interpreted. As a practical implication these results provide feedback about students’ knowledge to students and teachers, and show the level of actual knowledge of students across the Years. Furthermore, the results demonstrate students’ learning characteristics, e. g. which learning strategies they use, what kind of self-efficiency and self-esteem they demonstrate. Feedback was also provided regarding these issues.

**Vertical comparison using reference sets**

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In educational assessment often comparisons are made between students with a different educational background. For example if performance levels are defined across students from different grades or across students following a different track of education. To be able to link the assessments vertical equating procedures are defined. These procedures will take into account that for some items the item characteristics differ between groups of students (DIF). In situations where the proportion of items with differences is large the validity of the vertical linking is challenged. This will especially be the case if designated tests are constructed for the different groups of students. In this paper an alternative procedure is introduced and compared with vertical equating. In this procedure a set of items is constructed that will serve as a basis for comparison between the different groups of students. This set of items consist of samples of items from the test for each of the groups of students and is called a reference set. The content of the reference set represents all aspects of the intended construct and is composed in such a way that none of the groups of students is advantaged. For the total reference set data are collected in each of the groups of students. Subsequently, tests for each of the groups of students can be linked to the reference set separately. For each test all score points are linked to scores on the reference set and as a consequence to a common metric.

**Argumentative writing and academic achievement: A study on Chilean university students**

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Capitalizing on the implementation of a writing assessment implemented at a major Chilean university, we assess how predictive writing is of subsequent academic achievement. First, using a multilevel analytic approach (n=2597), the study shows that, after controlling for socio-demographic variables and the university admission tests, writing skills significantly predict first-year university grades. Second, using information about the performance of students during their first eight semesters in the university (n=1616), a longitudinal hierarchical analysis showed that writing remains a significant predictor of university grades over time, also after controlling socio-demographic variables and university admissions tests. Moreover, language skills retain or improve its predictive role over time, whereas mathematics skills seem to decrease in their importance. Our results show that writing, and the cognitive skills involved in writing, play a critical role in advanced stages of academic training, consequently offering additional support for the consideration of this ability for university admission purposes.

On the relation of speed and ability dimensions within and across domains

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'Speed' represents a major characteristic of the test taking process. To investigate the multidimensionality of speed and to compare it with the structure of corresponding abilities, the domains of Numeracy, Literacy and Problem solving were analysed. Specifically, the following research questions were addressed: (1) Is there a significant association between speed and ability within a domain? Does this association vary across domains? (2) Is there one overall speed dimension across domains or are there distinguishable speed dimensions? (3) Within a domain, is the relation between speed and ability the same for easy and difficult tasks? The German field test data of the Programme for the International Assessment of Adult Competencies (PIAAC) study was used with a sample size of about 1000 people aged from 16 to 64 years. Results showed that speed is significantly negatively related to the corresponding ability factor but clearly distinguishable.
The strength of the speed-ability correlation varies substantially across domains. The only moderate correlations between speed factors across domains contradict the notion of a general speed factor; the correlations between speed factors were substantially lower than the ones between corresponding ability factors. For both Numeracy and Literacy, but nor for Problem solving, the relation between speed and ability was clearly affected by the range of item difficulty, i.e., when completing difficult tasks lower speed may be beneficial while for easy tasks there is no association between speed and ability anymore.

Assessing business and economic competence of university students using adapted international tests

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In the literature on Germany’s current reform of study models in universities, there is a consensus that students should acquire ‘competencies’. However, specifically the disciplines of business and economics, despite being popular with students, are still lacking an academically approved German-language instrument for the assessment of (professional) business and economic competence. Funded by the Federal Ministry of Education and Research, the project WiwiKom strives to remedy this research deficit by pursuing two goals in an iterative approach. One goal consists in developing a competence model with established curricular and content validity; the other goal consists in creating a German assessment instrument through the adaptation of two international assessment instruments so that the theoretically postulated competence structures and levels can be measured empirically. To this end, two instruments from the U.S. and Mexico were translated by experts and validated with respect to content through expert interviews and cognitive interviews with students. Curricular validity was tested through an online survey and an analysis of module manuals from some of Germany’s largest business and economic faculties. The 220 test items approved in this process, and subsumed in different booklet designs, are currently being trialed in a first major field study with 3000 students of business and economics at 11 universities and 7 universities of applied sciences. The presentation will discuss the results of this study and feature key analyses, based on classical test theory and item response theory, showing how the items function depending on different institutional and individual factors.
How much g is in math literacy tests for primary school students?

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Two studies were conducted to analyze whether scores in math achievement tests at the end of primary school reflect only psychometric intelligence. In Study 1, n = 752 4th graders worked on a math literacy test (25 items) from the German National Educational Panel Study. In addition, two intelligence measures (verbal reasoning, 20 items; figural reasoning, 25 items) were administered. In Study 2, n = 305 5th graders worked on a math test containing items from the German National Assessment of Educational Progress at the end of grade 4. The same intelligence measures as in Study 1 were administered. Confirmatory factor analyses were applied to both data sets and support the existence of a domain-specific math factor beyond general intelligence.

A framework for incorporating implementation fidelity in educational evaluation studies

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Implementation fidelity (IF) is the degree of compliance between the concept, plan, or protocol of an educational program and its actual delivery in local contexts. Incomplete IF is not only a problem from a practical perspective, as indicated by implementation research. It is also a severe threat to the internal validity of evaluation studies, as it becomes difficult to attribute effects (or their absence) to an evaluated program if the program’s underlying concept has been implemented insufficiently.

Based on a comprehensive literature review, this theoretical paper proposes a framework for incorporating implementation fidelity in educational evaluation studies, comprising four stages: (1) Identifying evaluation contexts where IF needs to be accounted for, (2) identifying criteria relevant for IF in an educational program, (3) selecting methods for measuring IF according to these criteria, and (4) selecting methods for including IF in interpreting program effects. The application of the framework is illustrated by two case examples in the full paper. The significance of the research is that it offers a framework which allows a comprehensive consideration of IF in educational evaluation studies and accordingly enables researchers to avoid misconclusions on program effectiveness and ineffectiveness.

A Culturally-Related Multi-Media Task: Text and Image of Society in Transition to Modernity

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Transition to modernity affects society members’ knowledge and beliefs about their changing society and therefore, deserves consideration by educators. The present study examined Israeli Druze students’ perceptions of women’s roles in their changing society as elicited by texts and images. Students from elementary, middle, and high school levels were asked to choose one image out of a pool of ten, depicting traditional, transitional, or modern Druze women, and to explain their choices. In each age group, four conditions were designed. One classroom performed this task with no prior reading of a text, whereas the other three performed it after reading one of three text versions, traditional, transitional, or modern, describing Druze women. No significant age or sex patterns emerged. However, text reading significantly influenced image choices, in spite of deep cultural beliefs: Traditional explanations were mostly text-generated, whereas transitional and modern
explanations were self-generated. Students in the no-text condition tended to choose modern or traditional images of women. Implications for education and curriculum are discussed.

**Evaluation of Immersive Education Programmes: From an Outcome to a Process Focus**

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This is a study of Immersive Education (IE) programmes at Gymnasiums in Basel (Switzerland). It measured (a) whether students’ gains in English were sufficient in ‘guided writing’ and ‘reading comprehension’ for them to partake fully from the benefits of IE (‘threshold level’), and (b) what the influence of social learning (i.e. different types of interaction in the classroom) on the outcomes was. Data was gathered in a repeated measures design at two measurement dates (6 months apart) in an experimental-/ control-group design (N=106, Gymnasium Kirschgarten, Basel CH). Results for (a) were calculated by ANOVA (GLM, two factors, repeated measures), for (b) with a linear multiple regression. We found that students in IE programmes significantly outperformed those in control groups with respect to English competences, but that the influence of social learning on outcomes was not significant. The results confirm the effectiveness of IE for fostering English language competences. They also show that more effort is needed to understand the nature of ‘good learning processes’ in IE.

**Experiencing the realities of living between cultures**

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This paper is based on ethnographic research conducted in the north of England in autumn 2012. As universities encourage researchers to engage in international mobility projects, the need to be flexible and adaptable applies to the families of researchers, as well as the researchers themselves. This paper shares the experiences of an educational researcher as the parent of young children attending primary school in a different country. In the home country of Finland, Lukas (6 years) is a preschool pupil and Ella (8 years) is a second grader. In England, Lukas attended a Year 2 class for a month and Ella attended Year 4. For a bilingual family, the spoken language of school was not too challenging, however, the cultural differences of the two schooling systems had to be dealt with on a daily basis. This paper uses the comparative framework developed by Alexander (2001) to present the findings and draws on Bakhtin’s (1986) notion of outsideness to support the theorisation of this experience.

**Factors influencing attrition of South East Asian business students studying in Australia**

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Australia has a long history of educating international students; this study looks into the question of how academic motivations and general life goals influence attrition amongst international students studying a tertiary degree in Australia. Participants (N = 339) were students from South-East Asian backgrounds who at arrival in Australia did not meet university requirements and therefore enrolled in a university preparatory course. At the start of their course they completed a questionnaire which measured a range of study motivations and general life goals. The findings suggest that future relational goals (in relation to family and community) impact students’ persistence in finishing their degree. Students who valued future relational life goals higher were more likely to complete their course than those students who valued them lower. Interestingly, students’ academic motivations (those directly related to their course) did not relate to attrition. This supports the earlier research that long-term future goals affect student motivations (Oyserman, Terry, & Bybee, 2002). This study provides an opportunity to look deeper into the importance of background life goals and academic motivations of South East Asian international students studying at an Australian institution. It also yields useful information concerning optimising engagement and learning of international students.

Evidence based reasoning: The use of data in an argumentative text

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The claim of the present work is that along with argumentation strategies, students must also learn to use of inscriptions. However, research in the evidence based reasoning approach shows that individuals not only tend to use evidence in a biased way, but also they lack the ability to make arguments addressed to weaken the opponent’s claim. We address two questions: (1) do individuals use evidence differently according to whether it is in favor or against their position? and (2) do individuals make counter-arguments to weaken the evidence provided contrary to their own claim? High school students (N=46, mean age: 16;9) were asked to take a position in a nuclear energy dilemma and to write an argumentative text. Students were provided with 4 graphs (2 pro and 2 against). Our results show that most students used the data to confirm their position, and a minority used the data to counter-argue it. Those who did, were the ones whose use of evidence did not differ according to whether it was pro or con. An important educational implication of our work is that high school students are able to use inscriptions to build argumentative texts, but this use remains at a superficial confirmatory level.

Investigative skills: Can they be measured?
This paper describes the procedure for constructing and validating an instrument that aims to measure investigative skills. We have chosen to focus on those investigative skills that come into play in a non-linear process of empirical investigation, which incorporates the design and execution of experiments with an aim to formulate valid answers to an investigative question based on evidence in the form of collected data. Paper and pencil open-ended tasks were administered to 337 students, aged 9-15 yrs. The reliability and the content, construct and face validity of the instrument were estimated through procedures involving the analysis of both qualitative and quantitative data. Under a Rasch measurement framework, and in particular, with the aid of the Partial Credit Rasch model item/task measure and fit statistics are exploited to confirm the construct validity and the reliability of the instrument. Other indices from the model, such as differential and functional statistics are also used to check for the instrument invariance across sub-groups in the sample (i.e. gender, age) to ensure validity across different groups and the hierarchical structure of the developed measure. We discuss the use of this instrument in measuring the development of investigative skills through elementary and middle school students' participation in a specially designed form of the Science Fair and other educational programs that promote similar purposes. We also discuss this effort in the light of a broader emphasis on assessing science-related competencies.

The Impact of School-Readiness Skills on Students’ Science Achievement

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Previous research has shown that the developmental levels of some school-readiness skills have a marked influence on acquiring science knowledge. The present study aims to examine (1) the predictive value of school-readiness skills on acquiring science knowledge (2) which skill(s) account for students’ individual differences the most, and (3) if the predictive value of the school-readiness skills vary in students’ science, reading and mathematics achievement in Grade 4 and 6 on a
longitudinal sample (N=1908). Results show that students’ knowledge of science basic concepts improved significantly between Grade 4 and 6. The initial differences in students’ school-readiness skills also remain salient in students’ science achievement in Grade 4 and 6. Among the examined school-readiness skills (motor coordination for writing, vocabulary of relations, elementary arithmetic, comprehension of relations, and social skills), the developmental level of elementary arithmetic skills predicts future academic success. Elementary arithmetic skills have a significant impact on students’ science achievement as well as on mathematics and reading performance. The findings contribute to a better understanding of the factors influencing learning science subjects and reinforce the importance of the early diagnosis and enhancement of some fundamental school-readiness skills.

Implementing Nanotechnology in Urban U.S. Classrooms: No Small Task

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This study reports on a three-year implementation of curriculum in nanoscale research and applications in urban high school science. The research questions are: 1) What are the relevant factors that impact student science learning in a progressive science curriculum and instruction program; and 2) To what extent do these factors impact student science learning? Twenty-one teachers and 519 students participated. A multiple regression analysis showed impacts on student learning of the non-project related variables of free or reduced-priced lunch and teacher experience and project-related activities in terms of content, skills, and interests in STEM. However, other important variables showed no significant impact. Consequences of this research for improving equity and access of underserved populations in STEM are discussed.

Modelling of Competencies of Scientific Inquiry in Higher Education in Science Subjects

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Abstract
Investigating competence achievement and development has become increasingly important in the current educational research. This is valid for students in different stages of their learning as well as for teachers in different stages of their professional development. In light of numerous projects, which cover the field of student-centered research, there is an absence of research concerning pre- and in-service teachers. In particular, sciences lack theory-driven and empirically validated competence measurement. Veal (2004), or Bernholt, Neumann, and Nentwig (2012) are examples for such approaches. In this project, this desiderate is met through a large-scale assessment of teachers’ competencies in the field of Scientific Inquiry in biology, chemistry, and physics. A first explorative study in chemistry (N = 89) revealed sufficient item characteristics and obtained information on the high prognostic potential of fluid intelligence, prior knowledge and planned degree (Stiller, 2011). In order to assess the competencies in the field of Scientific Inquiry, based on a theoretical model, a paper-pencil-test with multiple-choice-single-select items has been constructed. Through a longitudinal study with about 1,900 undergraduate teacher students and about 500 graduate science teacher students and students of science, the structure and development of competencies in the field Scientific Inquiry is described. A recently conducted second preliminary study was used to generate appropriate distractors. The presentation is going to deal
both with the first and second preliminary study in chemistry. An over-view of the large-scale project is given.

**Forces and proportional relations in lower-secondary school: Results from the epiSTEMe project**

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The epiSTEMe project (effecting principled improvement in STEM education) seeks to develop a research-informed system of pedagogic principles to promote student attitudes and achievement in lower-secondary school. The epiSTEMe approach emphasizes dialogic teaching methods, while also calling upon cognitive research into the development of reasoning. It revolves around two modules in mathematics and two modules in science, with one of the latter (forces and proportional relations) providing the focus for this paper. The paper reports the final phase of the project, where the 11-lesson forces and proportional relations module was implemented in 14 classes (419 students), with some lessons observed. Student knowledge was assessed via ‘pre-tests’ prior to implementation, ‘immediate post-tests’ during the final lesson, and ‘deferred post-tests’ 4 weeks later. Just before the immediate post-tests, students completed ‘learning perception’ questionnaires to indicate their attitudes towards the module. Statistically significant pre- to immediate post-test gains were detected across the sample, and these gains were maintained through to deferred post-test. Generally positive attitudes were expressed via the learning perceptions questionnaire. Moreover, pre-to post-test gain in the epiSTEMe sample significantly outstripped that observed amongst control students (12 classes; 335 students), who studied forces and proportional relations using the methods normally followed in their schools.

**Exploring Science Education for Diversity**

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This paper describes the findings of the EU-funded ‘Science Education for Diversity’ project (SED) from the UK perspective. The project addresses concerns within the EU around declining interest in science education by focussing on issues of diversity and exploring science education across both EU and non-EU partner countries in which attitudes to science are variable. A comprehensive international mixed-methods survey and subsequent development and exploration of a ‘dialogic’ theoretical framework for teaching science education to diverse students suggested that in the UK, science is less popular than in non-EU countries as a result of narrow images of science that do not reflect students’ diverse self-concepts. The dialogic framework enacted in two UK case studies, which values diverse student voices, was found to enhance UK students’ attitudes to science.

Short time benefits of learning Physics in elementary schools

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First results of a large-scale longitudinal study on the effects of physics education in elementary school on meaningful learning in the long run will be reported. Around 100 elementary school teachers have been trained in teaching the topics ‘floating and sinking’, ‘building bridges’, ‘air and air pressure’, and ‘sound and spreading of sound’ to elementary school children (mean age=9;1 years). To find out whether the teachers successfully trained the students on the four topics, pre- and posttests for each learning unit were designed. From the 75 classes with available data sets so far we can conclude that teachers, who had no special university training in physics, are able to successfully teach the four topics. Students’ learning outcomes were similar to the outcomes observed in classes of distinguished teachers who had participated in a former study. We also found that boys’ and girls’ achievement improves to a similar extent. The complete data set will be available, soon, and will allow tracing back variance in achievement gains to individual as well as to classroom characteristics. We will then also be able to find out whether beyond content specific achievement gains early physics education gives rise to transfer effects on understanding the nature of science. Therefore, a test on understanding how scientific insights can be achieved will be presented to the children after having undergone instruction in the four learning units. The results for this test will be available for the EARLI conference.

Working Memory Training: A Support Tool for The Classroom?

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Are working memory (wm) trainings a means to reduce learning problems and enhance academic success? While for decades, wm functions have been thought to be hereditary and unalterable,
recent training studies have challenged this view. Since wm functions are fundamental for learning and general intelligence, and as wm deficits have been identified as one of the determinants underlying learning disabilities, this finding yields possible implications for learning at school. Yet, evidence for so-called ‘far transfer’ on non-trained cognitive tasks like reasoning or reading has been rather erratic, and the benefit for educational purposes is not conclusive. Based on the criticism and methodological recommendations issued by recent reviews, we conducted a study that aimed at examining the utility of wm training in the classroom. 99 typically developing 2nd graders were randomly allocated to 4 weeks of computer-based daily wm training, analogous reading training or passive control. We found that wm capacity and intelligence were enhanced after wm training, but not in the control groups, thus corroborating that wm capacity can be trained in a classroom setting. Moreover, our results suggest that motivation is a crucial and yet understudied factor influencing transfer effects. Further research should concentrate on motivational aspects of wm training tasks and on the influence of the training regime on the longevity of transfer effects.

Effective Task-Based Language Learning: To prompt or to recast?

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One of the issues in task-based learning is how and when to focus on form, while paying primary attention to meaning. In two experimental studies we examined the effects of corrective feedback on oral and written accuracy of two new grammar structures and oral fluency in a task-based learning environment. Another objective was to determine whether oral accuracy had an effect on oral fluency. In the studies 64 ninth-grade students (beginners and intermediate) learning German as a foreign language at a Dutch secondary school were assigned to three conditions: two experimental (one received prompts, the other recasts), and a control group. The two experiments were performed in sequence. Each experiment was spread over a period of three weeks, during 2 hours per week. The first experiment targeted ‘dative after preposition’, the second ‘comparatives’. Pretests and immediate and delayed posttests of participants’ included written and oral accuracy tests as well as oral fluency tests. Comparisons of the learners’ performance on the immediate posttests showed that, compared to the control condition, prompts and recasts were more effective on both structures. Furthermore prompts outperformed recasts on both structures (written and oral). However, the advantages of the prompts disappeared in the delayed-posttests for both structures. No condition effects were found on fluency. In addition, where recasts did not have a negative effect on oral fluency, prompts did in the delayed posttests of the first experiment.

Does Viewing Behavior Predict Learning Success in a Multimedia Learning Environment?

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This study uses eye tracking to identify different patterns of learning behavior in a multimedia learning environment and their relevance for learning results. For this purpose, 29 students completed a multimedia learning session on mitosis while their gaze movements were recorded. Learning outcome was assessed with three different posttest measures. Six eye tracking parameters indicative for the processing of the verbal and pictorial material were entered into a cluster analysis which identified three clusters of viewing behavior. Further analysis revealed that these clusters were also relevant to learning outcome: one cluster of learners showed strategic viewing behavior with high scores on all indicators which was associated with in good learning outcome. A second cluster was characterized by lower scores on all processing indicators and poorer learning outcome. Interestingly, the third cluster showed a processing behavior that was quite similar to that of the first cluster of successful learners except for the fact that students in this cluster showed even longer and more frequent processing of the text, but had poorer learning outcomes. These findings suggest that different processing strategies of multimedia material as indicated by learners’ complex patterns of viewing behavior influence learning success.

Does domain-general argumentation competence exist?

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The idea of domain-general competences is central for educational research. Their existence, however, is challenged from differential psychology as well as from expertise research, which favour general cognitive abilities and domain-specific knowledge, respectively, as the main explanatory factors for performance. This study aims to provide evidence for the role of argumentation strategy knowledge as a further explanatory factor for performance in argumentation tasks if general cognitive abilities and domain-specific knowledge are controlled for. The participants in this study were 123 university students who completed online tests for the three predictor variables and produced written arguments in favour of their opinion concerning energy supply. Using structural equation modelling, it could be shown that after controlling for general cognitive abilities and domain-specific knowledge, argumentation strategy knowledge still significantly contributes to the explanation of performance in argumentation tasks. Furthermore, a multiple-group analysis revealed that this relation between argumentation strategy knowledge and performance in argumentation tasks holds only for learners with domain-specific knowledge above a certain minimal threshold. These findings provide evidence for the existence of domain-general aspects of argumentation competence. Further research should elucidate the degree of generality of argumentation strategy knowledge and its interplay with domain-specific knowledge.
Learning approaches, prior knowledge, and student questioning in the comprehension of science texts

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The purpose of this study was to examine the relationship between reading comprehension of a science text and some cognitive and motivation related variables. Four hundred and forty-nine ninth-grade students completed a series of questionnaires that measured their approaches to learning science, text-based questioning, prior knowledge and comprehension of a science passage. Findings indicated that (a) students’ questioning explained a significant amount of the variance in ability to comprehend a typical science text, after accounting for the contribution of prior topic-relevant knowledge and learning approaches, and (b) the way in which students experience and go about learning in science (i.e., learning approaches) might be influencing their reading comprehension of a typical science text and this influence may be partially mediated by students’ questioning in relation to text and prior topic-relevant knowledge. Surface approach contributed (negatively) both directly and indirectly, to a significant extent, to text comprehension, whereas Deep approach contributed (positively) to it but only indirectly. The theoretical implications for psychology and practical implications for instruction are discussed.

Exploring the differences of international students’ perceptual learning styles

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The study aims at examining the differences between west European and Asian students’ perceptual learning styles, and exploring the relationships between students’ learning styles and their academic achievements in international business study. 172 students from a Dutch university participated in the survey research. West European students significantly outperformed Asian students in academic performances. Significant differences in learning styles were also found between west European and Asian students in English, second language, business subjects, and group project learning. Besides, in comparison with Asian students, west European students like to learn from hearing words, taking notes of lectures, and getting involved in some classroom experiences such as role-playing. They may benefit more from lecture-based subjects than Asian students. Based on the findings, there are some practical recommendations for instructors in international higher education.

Learning from texts in upper primary school: Measuring and exploring students’ learning strategy use
Independently processing and learning informative study texts becomes increasingly important from the age of 11-13, when the focus shifts from ‘learning to read’ to ‘reading to learn’. In this respect, gaining insight in the development and stimulation of strategies aimed at improving learning from texts becomes crucial. The first goal of this study was to develop an appropriate measurement instrument concerning learning strategies of upper primary education students, as large-scale information on how and to what extent those students already apply specific learning strategies to learn from texts is scarce. In this respect, a task-specific self-report inventory of 38 items was developed and validated by means of exploratory and confirmatory factor analysis. The inventory consists of nine subscales (summarising, highlighting, rereading, paraphrasing, linking with prior knowledge, titles and pictures, strategic study approach, self-monitoring, and self-evaluation). The second goal was the exploration of different learner profiles on the base of students’ self-reported strategies and to investigate their relationship with students’ recall performance of the studied text. Cluster analysis yielded four distinct profiles (‘integrated strategy users’, ‘information organisers’, ‘mental organisers’, and ‘memorisers’). Integrated strategy users remembered significantly more than any other group. This study provides initial evidence that the developed self-report inventory concerning upper primary students’ learning strategies may serve as a valid instrument in assessing learning strategy use. Furthermore, it points at the importance of stimulating integrated strategy use from primary school on, devoting attention to efficient regulation of various text learning strategies.

Using graphic symbols to promote inclusive education

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The use of graphic symbols in mainstream schools is one outcome of inclusive education policies. Graphic symbols began to be widely used in the mid-1980s, primarily for communication purposes and were usually found in special schools (Lloyd et al., 1997 Mizuko and Reichle, 1989). However, it has been suggested that graphic symbols can support learning for all pupils, helping them access the curriculum and participate in classroom activities. These are graphic symbol practices that can be now found in some mainstream schools (Abbott, 2000, Pampoulou and Detheridge, 2007). In addition, in recent years there has been an increase in the number of special education teachers, teaching assistants and speech and language therapists appointed to support special needs individuals or groups who are now accommodated in mainstream schools under inclusive educational policies. This has led to a need for collaboration among professionals from different backgrounds. There is currently limited research on how teachers and therapists collaborate in their symbol practice in mainstream schools- an area this research study aims to illuminate. To this end, the study collected data on symbol use in four such schools; data included interviews, observations, visual evidence of symbol use and reflective journals. Findings suggest that graphic symbols can be used in a variety ways to support pupils who have difficulties accessing the curriculum or communicating with peers. Furthermore, although there was evidence of collaboration in all schools, this was mainly among professionals with a background in special education.

Academic self-concept and learners’ physiological recovery in stressful academic situations
Academic self-concept can be defined as an individual’s appreciation of her/his abilities. It is a personality characteristic that is assumed to have a large impact on learners’ attitudes, cognitions, emotions, and learning behaviors. In the present research it was investigated to which degree the academic self-concept may even influence learners’ physiological reactions, specifically recovery from positive and negative performance feedback in stressful academic situations. Seventy-four participants (37 males, 37 females) participated in an experimental study with a false feedback paradigm. Following completion of a mental arithmetic task, participants received either positive or negative (false) feedback on their performance. Participants’ academic self-concept in arithmetic tasks was measured as a covariate. Recovery of the participants’ heart rate was measured in two rest periods after completion of the arithmetic task. Recovery was defined as return to baseline values by calculating change scores derived from subtracting the mean heart rate during the first and second rest (recovery) period. A covariance analysis showed a significant interaction self-concept x feedback for the second recovery period. In the group having received negative performance feedback, participants with a more positive self-concept showed poorer heart rate recovery. In the group having received positive feedback, no effect of self-concept was observed. The findings indicate that negative performance-related feedback may prolong psychophysiological responses to stressful academic situations, in particular when the feedback is inconsistent with domain-specific self-concept. They have practical implications for understanding learners’ behavior in stressful academic situations and advise to support learners in the development of a realistic self-concept.

Metacognitive Accuracy and the Influence of Answer Scales

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We report results of two studies on metacognitive accuracy with undergraduate education students. Students were asked to judge their personal performance in a multiple choice exam as well as to state their confidence in their self-evaluative rating. In each study, we realized four different research conditions that differed only in the type of the presented 5-point confidence rating scale. In study 1, four bipolar scales with different labels (verbal, numerical, smiley, plus/minus) were realized; in study 2, unipolar and bipolar scales (smiley as well as plus/minus) were implemented. Our aim was to investigate how accurately undergraduate students of varying performance levels estimate their
personal performance in an exam, how confident they are in judging their performance and if confidence ratings and their adequacy depend on the provided scale. We assumed that smiley faces inherit emotions and therefore influence answer behavior in a positive (higher ratings), but not more accurate way. The results of study 1 with 420 students show that undergraduates in average provide accurate performance estimations. However, students were not aware of how accurate they judged their performance. In addition, we could show that the type of provided scale significantly influenced the confidence ratings. Counter-intuitively, students giving confidence judgments on the smiley scale showed most appropriate confidence ratings. Study 2 with 348 students could replicate the findings of the first study and give further insight in the effects of uni-versus bipolar answer scales.

Prior content and metacognitive knowledge activation effects in comprehensive reading

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Research on prior knowledge activation has consistently shown that activating learners’ prior knowledge has beneficial effects on learning. If learners activate their prior knowledge, they can use it as a framework for establishing relationships between the knowledge they already possess and new information provided to them. Thus far, prior knowledge activation has dealt primarily with content knowledge in specific domains. Students also possess metacognitive knowledge, which should aid in deploying helpful strategies during reading. Thus far, no studies have investigated what effect prior metacognitive knowledge activation has on text comprehension. In this 2 x 2 study, we investigate both the effects of prior content knowledge activation and prior metacognitive knowledge activation on text-comprehension scores of 108 primary education students. Results show that both types of interventions have beneficial effects on text comprehension scores, but activating prior content knowledge seems superior to activating metacognitive knowledge.

Can Prior Knowledge Adequately Predict the use of Metacognitive Processes during Hypermedia Learning

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Abstract: Research on self-regulated learning (SRL) in hypermedia learning environments is an important area of research, which contains an array of interesting domains and topics. One such domain; prior knowledge, can influence how students interact with hypermedia learning systems in terms of their use of SRL strategies. In this study, we investigated 48 undergraduate participants’ interaction with MetaTutor, a hypermedia-based learning environment, which teaches students about the human circulatory system, and how their prior knowledge levels may have affected how they used particular SRL strategies in terms of frequency of use; whether the strategy was self- or agent-initiated; time spent on relevant compared to irrelevant pages; and time spent using particular SRL strategies. Results showed no significant differences between high and low prior knowledge groups, which can have important implications on how we design hypermedia environments. Future studies should investigate where differences between students with high or low prior knowledge occur in terms of using SRL strategies, which can help researchers design a learning environment with agents that adapt to individual needs in terms of cognitive, metacognitive, motivational, and affective processes.

Effects of a premature transition on German students’ academic and social self-concepts

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The school system of the German federal city state of Berlin is exceptional as a minority of students (8%) change from elementary school to the academic track (Gymnasium) of secondary school after grade 4 while the majority of students stay in elementary school until the end of grade 6. This study examines whether the stability and trajectory of social and academic self-concepts differ between students experiencing the earlier transition to the high ability track of secondary school (Group 1: N = 1647) and students who remain at elementary school (Group 2: N = 2856). Students’ self-perceived academic competence and peer popularity was measured twice (T1: beginning of grade 5 in Group 1/ end of grade 4 in Group 1; T2: end of grade 5 in both groups). Latent autoregressive multigroup analyses demonstrated high and similar stability of both facets of students’ self-concept across groups. Latent change score models demonstrated increasing levels of academic and social self-concepts between T1 and T2 for the students of Group 1, hence, for students with a premature transition to the high ability track of secondary school. Students’ self-concepts might benefit from belonging to the group of students who had the opportunity to change to the high ability track of secondary school earlier than others. These results correspond to the assumption of the reflected-glory effect on self-concept (e.g., Marsh, Kong, & Hau, 2000).

Relations between Students’ Reading Self-Concepts and Teachers’ Gender Stereotypes about Reading

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Gender stereotypes of significant others such as teachers, parents, or peers are supposed to affect students’ competence beliefs, values, and achievement related behavior. In this longitudinal study comprising two occasions of data collection, at the beginning of Grade 5 (T1) and the end of Grade 6 (T2), we drew on a sample of 53 teachers and 1237 students to investigate if teachers’ gender stereotypes on reading—i.e., their belief that girls outperform boys—were related to students’ reading self-concept. As expected, a negative association between teachers’ gender stereotype at T1 and boys’ reading self-concept at T2 was recorded using multilevel modeling controlling for T1 reading self-concept. For girls this association did not yield significance. Implication of the results will be discussed.

Classroom Management and Teaching Adaptivity: Effects on Interest Development

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Interest theory describes the development of interest as an individual process, in which repeated experiences of situational interest lead to individual interest as a relatively stable characteristic of a person. Based on teaching effectiveness research we assume that in classroom contexts the collectively shared experiences of a given learning environment influence the development of interest on a classroom level. Using a multilevel latent change model, we examine effects of individual and classroom-level perceptions of two teaching-process-related variables, in particular classroom-management (rule clarity and teacher’s monitoring of student’s activities), and teaching adaptivity on the development of domain specific interest. The study took place in 65 social-sciences classrooms of German ‘Realschulen’ (middle track schools) over six months with six measurement points. We found significant effects of students’ perceptions on both levels with classroom management as the stronger predictor. Implications for research and practice are discussed.

Factors Influencing Teaching Choice among first year student teachers in Estonia

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The shortage of teachers is a problem in many European countries, including Estonia. Teaching is not popular career for young people, teaching has been among the least preferred occupational preferences (Krips et al., 2009). To get more candidates for the teacher training programs who could become good and responsible teachers we need to know about the factors influencing teaching choice and perceptions about the teaching profession among pre-service teachers. The aim of presentation is to give an overview of motivations and perceptions among first year student teachers.
encompassing preschool, primary, basic and secondary education. Additionally we search for differences between the subgroups of pre- and primary school student teachers and basic and secondary school student teachers. The sample consisted of 284 respondents from two Estonian universities. The FIT-Choice Scale (Watt & Richardson, 2006) was used as instrument for data collection (includes 40 items about factors influencing teaching choice (motivations) and 20 items about perceptions). We have found the factor structure consisted of 10 motivation factors and 6 factors of perceptions about the teacher profession. The highest motivation in the teacher career choice was found to be work with children/adolescents. For the perceptions about the profession the highest means we found for expertise.

Conceptualizations of Disability Related Issues in the New National Curriculum in Cyprus

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The present paper reports on part of the findings of a study about the New National Curriculum (NNC) for Greek-Cypriot public schools. Using content analysis, the findings focus on how language defines or describes the concepts of diversity, human rights, social justice and disability. Notwithstanding the human rights and antidiscrimination rhetoric that surrounds the process of creating an inclusive NNC, the findings presented herein suggest that the curriculum seems to consider the student population to be a homogeneous group of children expected to conform to the traditional rules of knowledge acquisition. Based on this finding, the study indicates the dangers inherent in implementing the proposed NNC in its current form.

Effects of a metacognitive intervention in a hard of hearing pupil with developmental disability

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This paper reports the results of a metacognitive intervention in a 9 year old hard of hearing girl with developmental disability. The training consisted of 10 sessions that took place at a clinical service outside the school. The goal was to develop metacognitive processes (planning, monitoring, metaknowledge), as well as to teach the pupil different cognitive strategies (e.g., exploration, analysis, comparison, verbalization, using external memory, gestures that support cognitive activity). During the intervention, a learning support assistant also worked 10 times with the pupil in the
classroom: while helping her with the regular school tasks she had to complete, the learning assistant reminded the pupil to use the various strategies. The intervention effects were measured on different tasks presented at pre- and posttest: mathematics (word problems), regular school exercises the pupil completed independently during school hours, as well as mathematics achievement tests that were part of the regular school assessment procedure. Performance (correct solutions) and self-regulation skills were evaluated. The latter were assessed by means of an observational checklist focused on the applied metacognitive processes, strategies and motivational variables, as well as metacognitive interviews, and trace data. The school tasks and the achievement tests that were completed in the classroom allowed us to estimate transfer effects. Results show that the intervention was effective, as the pupil progressed significantly on all levels (self-regulation, performance, and transfer context). The limitations of this case study will be discussed.

Enhancing literacy skills of students with reading disorders: A Dutch Randomized Controlled Study

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Literacy skills are prerequisites for learning. It is not surprising, then, that students with reading problems have difficulties keeping up at school. The current study investigates whether the development of literacy skills can be enhanced in adolescents with reading problems in a native language with a transparent orthography (Dutch). We describe a large-scale, longitudinal Randomized Controlled Trial study investigating the effects of a multi-component intervention covering the full range of Dutch secondary education. This intervention was combined with the use of Microsoft Office, or Microsoft Office and text-to-speech software to facilitate the development of students’ literacy skills. First, we investigated whether intervention enhanced the development of students’ literacy skills. We found that intervention improved students’ reading accuracy at the word and text level, and reading rate at the word level. Moreover, intervention significantly enhanced students’ spelling skills. This finding indicates that intervention can improve reading accuracy and rate, even for late learners. Second, we investigated the effects of text-to-speech software on students’ literacy development. We found that this software mainly has a compensating, and not so much a remediating effect on the development of literacy. In conclusion, the present study shows the effectiveness of a practically useful multi-component intervention that combines reading fluency training with trainings that focus on other literacy skills. The use of text-to-speech software, in addition to intervention, mainly serves a compensating and not so much a remediating function.

Teachers’ characteristics and teachers’ capacity to meet (additional) educational support needs

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Today’s mainstream education reinforces teachers being pro-actively aware and responsive to the diverse educational needs of their students in their classrooms. The research reported in this paper wishes to specify teachers’ characteristics which are relevant when defining students’ additional educational support needs in mainstream primary education. The study sample consists of 82 Dutch teachers. Teachers selected two students as in need of more support to meet educational goals. First, teacher assessed students’ additional educational support needs. Second, teachers’ personality traits and self-efficacy beliefs were measured. Results show that several teacher characteristics (experience, self-efficacy, personality) relate to their abilities to meet educational needs. The results are important when discussing teachers; practice of meeting different (additional) educational support needs are discussed.

The interaction between the reader’s prior knowledge and depth of reading comprehension

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In this Knowledge Era, the importance of being able to read expository texts critically cannot be overstated. It is, therefore, fundamental to identify classroom practices with known effects on specific aspects of reading. Comprehension occurs through the interaction of three critical elements: readers’ characteristics, properties of the text, and the goals or instructions of the reading task. Prior knowledge is considered one of the most important predictors, however there is a lack of reading comprehension interventions specifically addressing this component. In this study, an intervention based on prior knowledge activation was compared to reciprocal teaching and teacher-centered didactic, in terms of efficacy on several levels of reading comprehension. 188 secondary schools students participated in the study. Overall, the intervention based on prior knowledge was more effective than the other two conditions, but its effect depended on the text’s disciplinary content. Educational implications for these findings are discussed.

Accuracy of Teachers’ Judgments of Students’ Academic Achievement and Misjudged Students

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The study aimed to examine the accuracy of teacher judgment of student achievement, uncover variables moderating the accuracy, and explore motivational and emotional characteristics of misjudged students. Sixteen English teachers judged the English skills of 505 Chinese fifth-grade students. Students completed a standardized English test and a questionnaire on motivation and emotion. Results showed that teachers judged the rank order of student achievement very
Teacher judgments were fairly accurate, teachers’ underestimation was associated with negative motivational and emotional characteristics of students.

Exploring the Quality of Formative Assessment Practices through Sequential Analysis

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Video recordings have become widely used as a source of information in educational research. A frequent analytic practice is to develop a coding scheme and determine frequencies with which the codes are observed. However, codes do not necessarily provide the dynamic aspect of what it is being observed (e.g. what comes first and what follows it). In this paper sequential analysis is explored as an alternative strategy to capture the flow of informal formative assessment that takes place in whole-classroom conversations. We use the ESRU cycles, Teacher Elicits student ideas, Students share their thinking, Teacher Responds to students’ ideas, and Teacher Uses or acts upon those ideas to advance students’ learning, as a framework to capture such a dynamic. Using transcriptions of video recordings of classroom discussions about density, we use sequential analysis to explore the relationship between teacher and students’ moves. More specifically, transitional probabilities of teachers’ and students’ moves in classroom conversations are calculated to evaluate the effectiveness of the ESRU cycle to reflect effective approaches to formative assessment. The transcriptions of video recordings of four middle school science teachers’ whole-class discussions are used to explore the advantages of sequential analysis over reported frequencies. Results indicate that transitional probabilities illustrate more accurately the dynamic of the implementation of informal formative assessment in the classroom.

Instructional activities that enhance vocational learning among students in a 3D game setting

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Research on technology-enhanced learning (TEL) has typically built on the idea that technology enables learning methods to be designed that bring new kinds of learning activities to traditional classrooms. During the past several years, TEL environments have rapidly improved through the development of social media, 3D spaces and games for learning. Thus, technology can be utilized to enhance vocational learning, for example, by offering more illustrative spaces to practice work skills compared to traditional methods. At the same time, new technologies create challenges for teachers when developing instructional activities, especially in terms of teacher-student interactions. This study focuses on teachers’ instructional activities that empower vocational learning in a synchronous 3D game setting. In order to understand the role of teachers, the study closely investigates teachers’
and students’ interactions. The first aim is to find out how students differed from teachers in terms of their topics of discussion while working in game environment. In a second aim, the effect of teachers’ participation in the discussion is investigated. Sixteen vocational students and four teachers participated in the study, altogether four groups of five people (N=20). The empirical study included working period in a scripted 3D game. A quantitative content analysis of 8188 utterances was conducted to shed light on the interaction processes taking place in the 3D game. Findings indicate that when teachers’ and students’ interactions are mediated by a 3D game, teachers seem to apply discussion activities that are different than those used in traditional classroom settings to empower vocational learning.

**Signaling in Collaborative Multimedia Learning**

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Collaborative multimedia learning is a complex and demanding scenario. Differently coded representations, interactive components, and communication have to be managed and processed simultaneously. Focusing learners’ attention to relevant information can help to reduce complexity and proved to be quite effective in individual as well as collaborative learning settings. This study was designed to integrate these research fields and to investigate whether focusing attention by highlighting information reduces cognitive load and improves different forms of collaborative learning with multimedia. Learning dyads were compared in four experimental groups, which differed with regard to highlighting meaningful information during two subsequent collaboration phases. During a first collaboration involving differently coded learning material, learners in two experimental groups (MER+/DIV+ and MER+/DIV-) were provided with visually highlighted learning material. During the second collaboration involving interactive animations, again only two groups were provided with relevant aspects of the learning material (MER-/DIV+ and MER+/DIV+). Preliminary results (N = 24) indicate that focusing learners’ attention to meaningful aspects during collaboration improves learning outcome, especially regarding representational transfer and intuitive knowledge. However, an expected positive effect regarding cognitive load could not yet be shown. Furthermore, preliminary analyses suggest that highlighting information guides learners’ attention to the most relevant components and causal connections, thus structuring communication behaviour in a more systematic and beneficial way.

**Increasing Sustained Learning and Memory in Students by Using Wooden Blocks Prior to Learning**

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Being a basis for reasoning, the construction of mental models within learning processes is considered an adaptation between a symbolic world of mental representation and the real world. In our experiment, students (N=125) explored conceptual spaces prior and after a learning sequence by using different tools: concept-maps and real wooden blocks. While the post-learning concept-map group performed best at the post test-the pre-learning wooden-blocks group showed the most sustainable results a week after the treatment. In this paper presentation, we also discuss the theoretical ramifications of the complex interactions in this experiment towards spatial reasoning, mental models in learning and instruction and meta-cognition.

**GPS: The Game Perception Scale - Measuring student’s perceptions of a GBLE**

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The effectiveness of an instructional method, such as a game based learning (GBL) environment, may be affected by students’ perceptions about that environment. Based on perception literature, in this contribution perception is defined as (1) students’ expectations about the goals of the environment and (2) the degree to which a student believes that using GBL will enhance his or her performance on which the GBL focuses. Despite the pervasiveness of perception and considerable impact of perception on the use of ICT for educational purposes, there is a surprising paucity of perception assessment instruments. The present proposal expands on this through the development and initial validation of the Game Perception Scale (GPS). The GPS-9 was tested via a pilot-study. In this pilot, the underlying structure of the GPS was examined to determine if the items reflected the two dimensions based on the abovementioned definitional elements. The preliminary results indicate that both dimensions are represented in the GPS, which also seemed internal consistent.

**Tutor Characteristics in Problem-Based Learning (PBL) and Their Effects on Student Achievement**

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This study investigated the influence of tutor characteristics in problem-based learning (PBL) on student achievement and extended previous studies in this respect by using a within-subject design. Differences in tutor characteristics (i.e., expertise use, cognitive congruence, and social congruence) among four different tutor types (i.e., course coordinator tutor, internal-staff tutor, external-staff...
tutor, and student tutor) were examined as well as the influence of these four tutor types on student achievement. Participants were 36 first-year psychology students who were enrolled in a PBL environment, who had experienced all four tutor types in the course of an academic year, and who had rated these tutors on their expertise use, cognitive, and social congruence. Results indicated significant differences in tutor characteristics among the four tutor types in favor of course coordinator tutors for both expertise use and cognitive congruence. Also for social congruence, course coordinators scored higher than internal staff and student tutors. These higher ratings were, however, not reflected in student achievement. Implications are discussed.

Using a General Problem-Solving Strategy in Geography to Facilitate Learning

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According to Geary (2012) general problem-solving strategies are a form of biologically primary knowledge as humans have acquired them over many years and use them to solve novel problems. Based on this argument, cognitive load theory was used to hypothesise that in certain situations, novice learners could be trained to use such previously acquired strategies to solve a range of domain-specific problems. To assess the validity of this line of reasoning, forty-five 14 to 15 year old students were required to solve geography problems. During acquisition, one group of students was instructed to use a general problem-solving strategy based on generating as many ideas as possible, whereas a second group was required to use a conventional problem-solving strategy. Results demonstrated that the general problem-solving group solved more similar and transfer test problems than the conventional problem-solving group. This study found that previously acquired general problem-solving strategies can promote both learning and transfer, when novice learners are instructed to use them.

The struggle to understand: Medical students’ potential pathways towards understanding

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The task medical students are facing, to learn a substantial amount of details and integrate these into a coherent whole in a limited time frame, is demanding. The aim of the present study was to explore students’ journey towards understanding during a course in an undergraduate medical programme. Seven students were interviewed in group, and seventeen students reflected in writing. Data was gathered from both groups at five separate times during the course, and analysed with a thematic analysis approach. Our findings suggest that students seek different forms of understandings as they get to grips with their studies. The forms of understanding found were: understanding as ‘knowing the language’, ‘knowing the map’, ‘knowing the catalogue’ and as ‘experiencing an integrated whole’. Early in the course the students appeared to focus on the first two forms, and later in the course, as they learned more details, they focused on the ‘catalogue’ or the ‘integrated whole’. Our findings suggest potential pathways students might take towards a deep understanding. The teaching design clearly influenced learning.

The accidental resurrection of the idea of ATI (aptitude-treatment interaction)

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In helping learners make a novel meaning their own, such as teaching students a new concept in school, we frequently point to examples that share the aimed-at meaning, but differ otherwise. This approach rests on the assumption that novel meanings can be acquired through the experience of sameness against a background of difference. This paper, through an experimental study, tests the conjecture derived from Variation Theory (of learning) that new meanings are acquired from experiencing differences against a background of sameness, and that the pattern of variation and invariance consistent with the conjecture is relative, both to the object of learning and to the learners. The specific object of learning was the economic principle that the change in price is a function of the relative magnitude of change in demand and supply. Two patterns one that was consistent with the conjecture and one that was not were built into learning resources. A total of 231 Grade 10 students from seven schools representing different levels of academic abilities were randomly divided into two groups, and each group was supplied with one of the two sets of learning resources. The students were asked to engage in independent learning to appropriate the object of learning. The results of the pre- and post-test showed that different patterns of variation and invariance were consistent with the conjecture for different groups of students and that those that were aligned with the prerequisites of the learners yielded strikingly better results than those that were not so aligned.

Creating Learning Situations to Make Diagram Use Inevitable: Focusing on Diagrams for Communication

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Diagrams are effective tools for understanding and problem solving. However, students’ poor diagram use has been identified as a problem. To enhance students’ diagram drawing skills and to address problems in diagram use, creating learning environments in which students inevitably have to use diagrams is important. To realize this, communicative learning environments are considered effective as students would feel a greater necessity to use diagrams when they are expected to explain to others. Thus this study examined the hypothesis that an interactive peer instructional learning environment would better promote students’ spontaneous diagram use compared to a non-interactive environment. Eighty-eight university students were randomly assigned to one of two conditions: interactive and non-interactive. After reading a passage, participants in the interactive condition were requested to explain the content of the passage to another participant next to them. In contrast, participants in the non-interactive condition were asked to record an explanation using an IC recorder by imagining that they were explaining to another person. A sheet of paper was provided to participants during the explanation and diagram use on the paper was analyzed. The result revealed that students’ diagram use in the interactive condition was higher than in the non-interactive condition. This suggests that teachers’ provision of interactive communication situations, during which students need to explain what they have learned to others, promotes spontaneous diagram use. Although promoting the communicative use of diagrams has not been sufficiently examined in previous diagrams research, this study suggests the importance of focusing on this aspect.

**The influence of epistemological beliefs on university education students’ informal reasoning**

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The purpose of this study was to investigate the role of epistemological beliefs (EBs) on university education students’ informal reasoning (IR), about socio-scientific issues (SSIs). We used dual-process theories to represent the underlying cognitive process. These theories postulate two distinct processes of reasoning, heuristic/spontaneous processes and analytic/reflective processes - that compete for the control of the response constructed by participants during reasoning tasks. In a sample of 60 Cypriot university education students, we examined the relationship among their EBs and their IR (heuristic/spontaneous thinking and analytical/reflective thinking) regarding different SSI-dilemmas. The students’ EBs were assessed with a quantitative questionnaire. Their informal reasoning regarding SSI was assessed with an open-ended questionnaire, where arguments, counterarguments and rebuttals had to be constructed. The open-ended questionnaires were analyzed qualitatively and quantitatively. The results showed that education students with sophisticated certainty EBs and sophisticated development EBs have a better heuristic / spontaneous thinking and analytical/reflective thinking quality regarding SSI-dilemmas, than students with naive certainty EBs and naive development EBs.

**An exploratory study of the enactment of a web-based environment for promoting argumentation skills**

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Reasoned argumentation has been identified as a core competency in science teaching and learning. In the context of online learning environments it becomes an important priority for sustained engagement of students in productive negotiation of ideas and evidence based reasoning. We report on an exploratory study of the enactment of a web-based learning environment (LE), on the topic of climate change, for promoting high-school-students’ argumentation skills. The enactment involved a class of 23 high-school-students and lasted twelve 110-minute-sessions. Students worked in groups and each group was asked to defend one of two specific positions (climate change as a man-made versus natural phenomenon). They were provided with a rich data set and were engaged, in a structured manner, in argumentation (construction of arguments, counterarguments and rebuttals). Prior to and after the enactment, data were collected through (a) two written open-ended tasks and (b) dyadic chats between peers asked to defend given, opposite positions about two specific issues (climate change and cystic fibrosis). Data analysis indicated an improvement in students’ ability to engage in argumentation. There was an increase in the evidence-based justifications included in students’ arguments in the written tasks, whereas the chats became richer in contributions directly related to argumentation (arguments, counter-arguments and rebuttals). Data analysis also revealed possible limitations, such as insufficient appreciation of the variation in the nature of counter-arguments and their relative strength. We conclude by considering the ensuing implications for teaching argumentation skills.

**Studying advanced mathematics develops conditional reasoning skills**

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Since the time of Plato, philosophers and educational policy-makers alike have assumed that the study of mathematics improves one’s logical reasoning skills. Today, this argument, known as the ‘Theory of Formal Discipline’ (TFD), is used in policy debates to prioritise mathematics in school curricula. However, there is no strong research evidence that justifies it, and some suggestive evidence that it is incorrect. Participants completed Evans, Clibbens and Rood’s (1995) Conditional Inference Task at the beginning and end of one year of post-compulsory study of either mathematics or English literature. Raven’s Matrices and the Cognitive Reflection Test provided measures of domain-general covariates. The mathematics students improved in conditional reasoning to a greater extent than the English literature students, despite having received no explicit tuition in conditional logic. Intriguingly, the improvement came about via increased rejection of invalid inferences and increased acceptance of the valid Modus Ponens inference, despite increased rejection of the valid Modus Tollens inference. This suggests that mathematics students do not develop logical skills in a straightforward manner. Instead, we suggest that they become more sceptical over time. Our results
are consistent with the claims made by Plato, and many others since, that studying advanced mathematics is associated with improved logical reasoning skills. This is surprising given previous research findings that not even training in formal logic brought about improved conditional reasoning performance (Cheng et al, 1986).

‘Two experts, five opinions!” Measuring Laypersons’ Beliefs about Reasons for Scientific Conflict

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To make personally relevant decision laypersons increasingly have to deal with science-based knowledge claims that are inconsistent. A thorough judgment usually requires conceptual knowledge laypeople often lack. Frequently they rely on the testimony of experts. Regarding contradicting knowledge claims laypersons have to decide which claim (or expert) they may believe. Subjective explanations of why scientists may contradict on the same topic may therefore influence the evaluation of the believability of knowledge claims and of the contradicting sources. Based on an interview study we investigated individuals’ reasoning on scientific controversies between experts and developed the Explaining Conflicting Scientific Claims (ECSC) questionnaire to establish an efficient measurement of laypersons’ explanation patterns. This contribution introduced the ECSC questionnaire and reports on three studies analyzing its dimensions, its reliability and validity, applied to controversies about medical and climate change topics. Factor analyses revealed four consistent dimensions measured by the instrument: Scientific conflicts are explained by reasons of personal benefit, differences in research processes, differences in competences, and thematic complexity of the research object (Study I). The dimensions proved stability in confirmatory factor analyses (Study II). The instrument’s validity is approved by its sensitivity to source information (Study III). Manipulation of source characteristics (e.g. researcher of public- vs. private-funded institutions) influenced significantly participants’ explanation patterns. The emergence of the dimensions’ pattern indicates that participants’ explanations are influenced not only by beliefs about the nature of knowledge, but also by beliefs about social practice of science. Educational implications of the differentiated beliefs will be addressed.

Student teachers’ professional identity development during the initial teacher education

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This research introduces new perspectives to the domain of teacher identity research that help to conceptualize integration of the ‘personal’ and ‘professional’ sub-systems of self during processes of learning to teach by students or beginning teachers. Utilizing pedagogical dilemmas, we focus on the
dynamics of the professional identity of 17 student teachers in the period of two year teacher education program. We specify how students handle ambivalent situations, and whether they use the professional position, the personal position or form a coalition between positions to solve the dilemmas. Based on the qualitative analysis of longitudinal data, we present seven developmental trajectories of student teachers’ professional identity development and discuss the practical implications for teacher education.

The importance of evaluation for planning a company training program: An exploratory interview study

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Focusing on the importance of information derived from training evaluation, this study aims to investigate exploratory decision processes regarding the development of the training program in human resource development (HRD). Fourteen semi-structured interviews with Australian and German HRD professionals reveal that various information types concerning training needs, training impact, input variables, economic figures, and business strategy are used and differ in importance for decision-making concerning training programs. The trend is that needs and training impact information are considered more important than economic figures and input variables, but costs or budget, training content and the provider are not factors which are ignored. Even if HRD practitioners are primarily influenced by intra- and inter-organizational factors in decision-making, they reflect training quality in their decision criteria, too. The comparison of information use suggests that particular evaluation information, primarily regarding training needs and transfer, is also used for legitimating decisions as well as for judging the quality of training and that there are perceptible differences regarding the functions, especially between conceptual and legitimative use. Future research should reassess the indications that the national context and the educational background of HRD practitioners influence decision processes.

Learning biographies as a means for teacher professionalisation on ICT use

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This paper aims to find more effective ways for teacher professionalisation on ICT use, by exploring ways to investigate teachers’ use of these media, as part of their identity. We conceive this identity as ‘a learning biography’. With this approach we follow recent changes in learning theory, which reflect a shift to learning as a horizontal process between multiple social systems. Learning as a horizontal process implies crossing boundaries between life domains where different meanings and social practices are at work. For this theoretical paper we use a grounded theory approach switching from literature to empirical explorations by means of the biographical interview. The results of this explorative study show how the use of ICT by teachers can be perceived as part of their identity or learning biography, how this implies boundary crossing between lifeworlds and negotiation between
agency and structure. The theoretical significance is how we can improve educational research by borrowing concepts from the sociological discourse on biography such as learning biography, agency, structure, life domains. The educational significance is to find clues for teacher professionalisation that are more effective i.e have biographical meaning.

**Improving teacher candidates’ classroom management. Effectiveness of a training program**

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Classroom management is a main challenge for teachers, novice teachers in particular. Still, classroom management is rarely incorporated in teacher candidates’ preparation courses. In the present study, a training program for teacher candidates focussing classroom management was evaluated. Various learning opportunities were implemented in order to meet the special needs of teacher candidates and to support the transferability of training contents. In a quasi-experimental design, 19 teacher candidates participated in the classroom management training (intervention group), and 24 teachers candidates served as waiting control group. ANCOVAs controlling for pre-test-scores show increased knowledge and improved skills in classroom management after the training in the intervention group, but not in the control group. The amount of improvement was positively associated with reported transferability of the training contents. No effects were found on student misbehaviour and student engagement. Subsequent research should examine long term development and sustainability of the found effects.

**Transactive interaction – Does training of transactive interaction enhance cooperative learning?**

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Transactive interaction implies acting on the contribution of the learning partner, clarifying or criticising it or combining the partners contribution with ones own and thus elaborating the learning contents. The purpose of the present study was to develop a training of transactive interaction and thereby to enhance cooperative learning. One hundred and ten undergraduates participated in a control group design with repeated measurement. Previous knowledge and self-reported transactive interaction in a cooperative learning situation were measured before training, and learning results and self-reported transactive interaction in a different cooperative learning situation were recorded after training. For transactive interaction clarifying transacts and operational transacts were identified. At both points of measurement cohesion as well as on task activity were gathered via self-report controlling for social or motivational effects of the training respectively. In both cooperative learning situations students worked in pairs with positive interdependency due to distributed
knowledge. The training focused on knowledge about transactive interaction as well as practicing transactive interaction and lasted 90 minutes. Taking into account the pre-test results post-test showed increased clarifying transacts in the experimental group compared to the control group. Yet for operational transacts no differences were found between the experimental group and the control group nor were there any differences regarding cohesion or on task activity. The experimental group outperformed the control group. The improved learning results were partially mediated by clarifying transacts.

Theorizing “Listening” in Online Discussions: Conceptualization, Research, and Design Considerations

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This paper presents the theoretical notion of online listening as a vehicle for examining how learners attend to the contributions of others in online spaces; this is part of an effort to broaden our understanding of the process of learning through dialogue in technology-mediated environments. Online listening is defined as the collection of behaviors learners engage in as they interact with the existing posts in a discussion forum; it is differentiated from the more generic act of reading (which can involve texts that are unitary, static, and cohesive as opposed to threaded discussions which are multi-authored, dynamic and segmented) and lurking (which implies a lack of subsequent contribution). Drawing on four years of research conducted through the (Blinded) research project, the presentation will include a (re)conceptualization of the notion of listening for online spaces; an explanation of a theoretical taxonomy for considering different kinds of listening in online discussion; documentation of empirical findings about both the specific patterns of listening in which students engage and their perceptions of these activities; and finally the design a novel graphical interface to support more productive online listening behaviors. Collectively, results indicate that online listening is a useful concept for investigating the ways learners interact with existing posts in online discussions and for designing technological and pedagogical interventions to support more productive participation.

Modalities of Distributed Teaching Presence in asynchronous discussion groups

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One of the main contributions of the e-learning model to the community of inquiry (CoI) framework is the key role that it attributes to teaching presence. In our view, it is the potential for distribution that makes the notion of teaching presence particularly relevant. Applying a socio-cultural approach, we explore the notion of Distributed Teaching Presence (DTP), based on the assumption that students’ learning is mainly related to the educational influence of others: that is to say, the support and help they obtain via their interaction with their teachers. The aim of this study is to analyze the contributions of participants to a discussion forum in order to identify different modalities of the exercise of teaching presence, in terms of three dimensions: the management of social participation (MSP), management of the academic task (MAT) and management of shared meanings (MSM). To explore the focus and the modalities of DTP, transcripts of interactions between two groups of postgraduate students in Educational Psychology and their teachers (n=23, n=16) were analyzed by two independent coders at micro level using content analysis. Applying three levels of analysis, we identified several participants as relevant contributors to teaching presence and seven modalities of teaching presence organized in three management categories: whole, mixed, and single. We discuss the limitations of our research model and propose further innovative research methodologies that may be able to support collaborative learning processes.

Providing support for collaborative online learning - an evaluation field study

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This pilot field study investigated the evaluation of virtual collaboration and of support methods over time. Based on the theoretical background of Kauffeld (2001) who distinguishes between a task- and a social level in collaboration, we asked 32 undergraduates studying pedagogy with a survey questionnaire to evaluate nine virtual collaborative phases of a seminar about ‘Attachment Theory’ in terms of collaboration on a task level (goal orientation, task completion) and on a social level (cohesion, taking responsibility) at three points of measurement. Furthermore as support is necessary in virtual learning, we also measured support methods, namely the design of group work and providing feedback. Results indicate a specific evaluation pattern which stayed almost stable over time. Taking responsibility was evaluated lowest indicating that there may be problems in this dimension in virtual learning environments due to the missing social presence. Over time, there were no great changes in evaluation. Correlation analysis indicates that specifically group design is connected with collaboration processes. The reason for this may be that group design affects more the collaboration itself, while providing feedback is more related to task performance. Overall, this pilot study shows that the problematic social dimension of taking responsibility is basically affected by the support method of group design which indicates a positive influence of supporting virtual collaboration. According to this pilot field study, it seems necessary to provide responsible support for online learning in terms of adequate group design.


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Analyzing the effects of school- or class-level composition on students’ outcomes is a major research area, not only in empirical educational sciences. Concerning the social composition of schools/classes, school effectiveness research shows that over and above the students’ individual social status, the student body social composition has unique strong effects on students’ cognitive and non-cognitive learning outcomes. Regarding achievement-related compositions, empirical results are diverse, also dependent on the different learning outcomes which are analyzed, e.g. achievement, motivation, or self-concept. To account for these differing results, research in which Frame-of-Reference models are employed is instructive: In these frameworks, two major reference group effects are distinguished. While the Big-Fish-Little-Pond-Effect describes the negative impact of class-level achievement on the academic self-concept of individual students, the Reflected-Glory-Effect depicts the positive impact of the student body composition on the individual students’ academic self-concept. It can be assumed that both effects emerge simultaneously in a given learning environment. The aim of the current paper is to disentangle the joint contribution of both reference group effects by applying multilevel latent models. We use data obtained from a sample of German 5th grade upper secondary-school students (n=3,229) and their parents (n=2,729). Our doubly-latent models indicate that while without controlling for class-level socioeconomic status, the Big-Fish-Little-Pond-Effect lacks statistical significance; whereas once class-level socioeconomic status is added to the model, the Big-Fish-Little-Pond-Effect becomes significant. We discuss our results with regard to both theoretical and methodological advances and against the background of our sample’s social selectivity.

Professional community presence in secondary schools across 40 countries

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Teacher collaboration and efficient work within professional communities in secondary schools proved to be an important predictor of student achievement in secondary schools. In this context, the question that appears is how are professional communities manifested in schools around the world? In order to answer such research questions, a cross-country research was performed including more than 35 countries from the ICCS 2009 dataset, countries organized in three modules, namely: the European Module, the Latin American Module and the Asian Module. The measurement proved equivalent in all 36 countries, the five items used to measure the concept created one factor (KMO = .81, all loadings higher than .67) with a good scale reliability (Cronbach alpha = .78, 5 items). The same good indicators were found in all 36 countries. The results found indicate that there is a difference in the mean scores of teachers’ perceptions regarding their participation in professional communities in the different countries and regions. In general, the teachers in Latin American module report the highest participation in professional communities. In addition, in two Asian countries, namely Chinese Taipei and Honk Kong SAR, the teachers report the lowest participation. Regarding European countries, most of them are situated in the middle of the range, with teachers in
Eastern European countries reporting relatively higher participation than teachers in Western European countries.

**Metaphors of learning in education: from conditioning via concept change to performative action**

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The categories we use structure our interpretation of the world. This goes for everyday life as well as for research. Many concepts that concern human cognition, and most other fields of research, rely on metaphorical constructions that have their origin way back in history. Memory, for instance, has been construed as a container or a store-house, where information is perceived, processed, stored and later retrieved. Learning is another highly ambiguous term that has been taken to refer to a range of phenomena studied in various theoretical traditions, all the way from conditioned reflexes to conceptual change and, in recent decades, in terms of enculturation into communities of practice. The term learning also operates as a ‘boundary object’ (Star & Griesemer, 1989), which makes communication between different stake-holders (teachers, students, parents, policy makers, politicians) possible even though the meaning attached to the term will differ sharply. The point of this presentation is to scrutinize how the metaphors of learning that have dominated educational research in the past century or so have changed, and what the implications of this change are for research and for the broader discussions of learning. It is argued that we now see a transformation from construing learning as a mental phenomenon to perceiving it in terms of its consequences for performative action. This implies that our criteria of what counts as learning are undergoing change.

**Reading motivation, reading amount, and reading comprehension in beginning readers**

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Reading motivation (RM) plays a fundamental role in the development of reading comprehension. An important finding is that RM is not simply a one-dimensional construct; on the contrary, there are many different intrinsic and extrinsic aspects involved. However, the specific direction and magnitude of these relationships between the aspects of RM and reading comprehension is not entirely clear. Another main finding is that the relationship between reading motivation and reading competence may be mediated through the amount and breadth of reading. Yet, very little is known about the differentiated reasons for reading when children are starting to learn how to read. Hence, the research on the facets of RM and their relationship with reading amount and reading comprehension is also quite sparse. We illuminate the development of a model of reading motivation in elementary school children and examine the effects of different types of RM on reading amount and reading comprehension in beginning readers (grades 1-3). With cross-sectional data from an ongoing longitudinal study we developed and tested a questionnaire consisting of these RM subscales: intrinsic RM= (1) object-related RM and (2) experience-related RM; extrinsic RM= (3) competition-related RM and (4) achievement-related RM. Our data confirm that RM is a multi-
faceted construct, even in beginning readers. Furthermore, we found that experience-related RM contributes significantly to reading comprehension. This relationship is mediated through the time children spend reading on their own after school. The facets of extrinsic RM seem to have no effect on either reading comprehension nor reading amount.

**Epistemic Understanding and Emotion Regulation in Children’s Conflict Resolution Strategies**

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The present research concerns emotional and cognitive factors in the conflict resolution strategies that children adopt. Specifically, it examines the relationship between emotion regulation strategies and epistemic understandings of the legitimacy of multiple perspectives and whether they might predict the conflict resolution strategy that a child adopts. The research asks: (1) How are individual differences in the tendency to use different strategies of emotion regulation related to conflict resolution strategies chosen by children? (2) How are individual differences in epistemological understanding related to conflict resolution strategies chosen by children? (3) Is the relationship between epistemological understanding and conflict resolution strategies mediated by emotion regulation strategies? In two studies, 5th graders were assessed for emotion regulation strategies and epistemological level. They were presented how they would solve conflicts presented in different scenarios. The second study created higher emotional arousal around the conflict. The studies produced similar results. In sum, those with absolutist epistemologies less likely chose prosocial conflict resolution strategies. Those using reappraisal emotion regulation strategies were more likely to choose prosocial conflict resolutions and less likely to choose coercive resolutions. The use of suppression emotion regulation strategies, which was related to absolutist epistemology, was more likely to predict coercive resolutions.

**Virtual communities of practice in academia: An automated analysis of expertise and expert status**

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Many academic institutions respond to the increasing need for knowledge sharing and collaborative knowledge building by initiating virtual communities of practice (vCoP). However, discrepancies between expertise and expert status may occur, lowering the vCoP’s productivity. This study aims at finding and validating methods to efficiently assess the relationship between expertise and expert status in vCoP. Based on a causal model that describes the effect of expertise on expert status mediated by participation, a social network analysis (SNA) combined with automated content analysis appears to be an adequate assessment instrument for interaction in vCoP. To verify the model and to validate the proposed tools, a vCoP at a North-American online university is examined. From a population of 470 faculty members, 120 produced 3898 messages in two years. The asynchronous, text-based interaction is analyzed using both conventional methods and automated content analysis. Preliminary results show moderate to high values of expertise and participation, and a large variance in users’ expert status. The results of manual and automated analysis are significantly correlated, suggesting acceptable validity of the employed tools. Expertise has a significant effect on expert status, showing low discrepancies between both. For educational research, the study confirms the research model and extends its empirical basis by more objective measurements. For educational practice, it suggests a method of monitoring and assessing interaction in academic vCoP. Further research is needed to identify more clear cases of discrepancy between expertise and expert status, and to additionally validate the analysis tools.

The role of peer groups in adolescent students academic self-concept and math performance

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This paper reports a longitudinal study on math performance and academic self-concept on student and peer group level. Adolescent students (N=1,152) were followed up from the end of compulsory education to secondary education. Preliminary results indicate that a reciprocal relationship exists between academic self-concept and math performance on student level. Multilevel structural equation modelling will be used to examine if peer group achievement has a negative effect on student-level academic self-concept, as is the case with school level achievement and student-level academic self-concept (the-big-fish-little-pond-effect). Furthermore prior research has found that academic self-concept mediate the relationship between perceptions of friends’ academic behaviors and academic performance. This study aims to advance the current knowledge base by examining the mediating role of academic self-concept between friends actual academic behavior and student
academic performance. This will expand our understanding on how peer groups affect adolescent students math performance, and if this relationship is mediated by academic self-concept.

**Situated learning as a chance for Roma inclusive education: A case study**

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Roma groups have been often associated with social problems and conflicts, which can be in many cases explained by a low level of formal education. Nevertheless, Roma have been traditionally developing expertise in several specific domains, which is likely to be achieved through alternative, informal ways, such as situated learning in communities of practice. However, empirical evidence whether and how situated learning may occur in successful Roma learning biographies is insufficient. Therefore, the presented study examines successful Roma learning biographies and aims at identifying elements of situated learning. As a representative case, the 16 years old Eliana was engaged in cognitive apprenticeship with school teachers, and she developed herself teaching skills that she applied while voluntary teaching for disadvantaged Roma children. Apparently, through situated learning, Eliana is a successful learner, and her learning is compatible with her cultural background. This suggests that situated learning may be introduced on a larger scale in schools to reinforce inclusive Roma education. The validity of the case study results is limited, more extensive research is needed to confirm the positive effects of situated learning, and to identify specific implementation strategies.

**University as a teaching-learning environment and changes in education policy and students’ attitude**

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The purpose of this study is to clarify what kind of conceptions students have about the university as a teaching-learning environment. The research material consists of 81 students’ writing in which they wrote a short narrative about what kind of teaching-learning environment the university according to their experience is or what kind of they would like it to be. The students’ answers can be grouped to four types according to how they are placed on the dimensions: individuality, collectivism and learning as consuming, learning as learning. ‘Individual educational career trackers’ saw the university as ‘a department store of educational alternatives’ and there the teaching to be given as a service which they consume in order to ‘perform’ learning. ‘Content ones’ manifested that the present university was the ideal one and the educational opportunities given by it were seen to enable their own, individual learning and development. For ‘students with larger view’ also the communal relations and their support were extremely important to them and their ideal university could be called ‘a multifaceted university’. ‘Communal consumers’ could be characterized as demanding, service conscious consumers and their ideal university to be ‘a communal service centre’.
First-grade retention, academic achievement, and the moderating role of extra support received

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This study examines whether students retained in first grade, relative to their similarly at-risk but promoted agemates in second grade, differ in terms of additional support received, and whether and to which extent additional support moderates the effects on their academic achievement. Data were collected from 3,624 students (121 schools) and their teachers, during three consecutive school years. Results show that almost 60% of first-grade repeaters receive at least some kind of additional support (mostly from several persons and for a combination of problem domain), with repeaters being equally likely to receive extra support as their agemates who had the same probability of being retained but nevertheless were promoted to second grade. Findings further seem to suggest that, at the end of their retention year, retained students achieve worse in math and reading fluency than their equally at-risk but promoted agemates, mostly regardless of being additionally supported. Practical implications are discussed.

Markets and High-stakes Accountability: Synergy for Good Schools? The Case of the USA and Chile

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In the current theoretical debates on school reform much credence is given to marketization and forward-leaning high-stakes performance management for improving school quality (New Public Management --NPM). While Chile implemented the most radical example of a school market decades ago, the U.S. opted for a highly bureaucratic high-stakes accountability system. Both countries encountered shortcomings regarding the quality of learning and teaching. Currently, Chile and the U.S. are in the process of correcting these shortcomings by combining market discipline with stringent performance management. The paper discusses whether the synergies between market and bureaucratic accountability can fix the quality deficit evidenced in each system. We conclude the paper with a discussion of a third way that is outside of the logic of NPM: an approach to professionalizing teaching that capitalizes on the precision of external quality measures, the autonomy of de-bureaucratized schools, and explicit rewards for teaching the most disadvantaged.

Positive matching and the role of teacher education’s allocation function

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This contribution presents the result of the analyses of a multilevel structural equation model on the impact of teacher education’s allocation function on the degree of positive matching in the education system. By means of latent class factor and latent class analyses we examined the impact of different combinations of relevant structural elements governing the assignment of newly trained teachers to schools on the level of the association between teacher shortages and school socioeconomic status (SES). This study includes secondary analyses of data obtained from various relevant databases (OECD, Eurydice, and Eurostat). The analyses are built upon an (as of yet missing) organizational approach to teacher education based on open systems theory. Given the missing organizational approach in research on teacher education, and the relevance of low teacher shortages independent of school SES for student achievement, this study fills a considerable gap in research on the relation of teacher education and the quality of education systems.

Context and Structure in Conceptual Change: Students’ Understanding of Price

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This study presents evidence of economics undergraduates’ conceptions of price and cost. It is a novel study in this field in so far as it explicitly investigates conceptions of phenomena which previous research has shown to be connected in students’ thinking. The evidence is used to highlight some dimensions of understanding of price and cost which are critical for instruction. Using this evidence the paper identifies some qualitatively different kinds of conceptual change. Conceptual change may occur within and between frameworks. In this case the frameworks are observed in the contexts that students use to frame their reasoning about price: an individual firm, a market or interactions between markets. The paper also suggests some implications of this proposal for relationships between insights offered by a range of theoretical perspectives: Knowledge-in-pieces, Alternative and Ontological frameworks, Variation Theory and Threshold Concepts.

Commonality: A theory for sustainable professional development through informal conversation

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Despite the frequent occurrence of conversations and their inherent potential for learning, conversation between academics and their role in academics’ learning as teachers have not been substantially explored. This study sought to remedy this and investigated academics’ experience of informal conversation about teaching within their departments. Thirty academic staff working in different departments at an Australian research-intensive university were interviewed and the transcripts were analysed using grounded theory (Glaser & Strauss, 1967). This analysis provides evidence that academics use conversation as a practical, individual and informal strategy for professional development. The use of grounded theory methodology also led to the emergence of a theory to account for much of the relevant behaviour within the contexts from which the data was collected. The theory of commonality, explains what triggers, encourages or hinders informal conversation between academics within the contexts of university departments. The theory of commonality has practical implications for those seeking to build on existing professional development by generating conversation between academic colleagues.

The role of conscientiousness, time management and action-state orientation in freshmen’s study time

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Students differ significantly in the amount of time devoted to studying. Given the importance of study time for academic performance, it is important to investigate the role of students’ personality factors in study time investment. The current study focused on the relation between conscientiousness and study time investment, and the possible intervening role of time management strategies and action-state orientation. Participants were 190 freshmen (74 women) studying business economics. Student ratings of three facets of conscientiousness were included: industriousness, perfectionism and perseverance. Regarding time management and action-state orientation, self-reports of short-term time management strategies, long-term time management strategies and confidence, disengaging vs. being preoccupied with failure, and taking initiative vs. hesitating were included. Finally, students continuously recorded their self-study time by means of a web-based application during the entire term for all courses. Our findings showed that students’ conscientiousness affects their self-study time investment, with each of the three examined facets (industriousness, perfectionism, and perseverance) showing differential pathways. These pathways involve short-term time management strategies and disengaging vs. being preoccupied with failure, two skills that may be susceptible to change and can be addressed by student counselors.

The interaction between student learning and factors enhancing or impeding their studying

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Previous research suggests that students with different approaches to learning perceive their teaching-learning environment differently. On the basis of these previous results, we aimed to explore how students with different approaches to learning perceive the factors that enhance or impede their study progress. The participants were 738 students from two different faculties (humanities and social sciences). The data consisted of their open-ended answers regarding factors they feel enhance or impede their studying and these answers were analysed by the method of content analysis. Additionally, the students were grouped into homogeneous subgroups on the basis of their approaches to learning (18 items). Four clusters emerged from the data: organised students, students applying a deep approach, students applying a surface approach, and unorganised students applying a deep approach. Chi-square tests were used to establish the association between perceptions of enhancing and impeding factors and cluster membership. The results revealed that students with high scores on deep approach and low scores on organised studying appeared to differ from other student groups. It seems that self-regulation is an important factor in determining how students will overcome factors impeding their studying. The results also imply that deep approach may cause the experience of heavy workload. It seems that students’ experiences of the factors impeding or enhancing their studying are related to both self-regulation skills and their approaches to learning.

**Individual congruence, congruence to peers’ occupation, and gender-untypical career aspirations**

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In the German-speaking countries the phenomenon can be observed that young adults stick to a very limited range of occupations in their career choice. One reason for such a restriction in choices may be that young adults orient themselves at their parents’ or peers’ occupational choices and not at their individual interests. 379 students from 12 pre-vocational schools took part in a questionnaire survey on their aspired occupations, the occupation aspired by their peers, their parents’ occupations, their vocational interest, and self-efficacy assessments. For each participant it was calculated how congruent he/she is with regard to their aspired occupation and a recommendation for an occupation based on their interest and self-efficacy. Furthermore, congruence to the occupations aspired by the two best friends and to parents’ occupations was calculated. In order to identify groups of students who differ with regard to their congruence patterns Latent Class Analysis was carried out. It identified four subgroups of which two stand out: A group of females with overall low congruence values (low individual congruence values and low congruence to peers and parents) and a group of males with low individual congruence and low congruence to peers but high congruence to father’s profession. In these groups a high proportion of students aspire gender-untypical professions. It seems that these young adults need special attention in career counseling.
They lack self-efficacy as well as interest in their aspired occupation. Career counseling should support these young adults by measures which raise self-efficacy and interest.

**Antecedents and Consequences of Achievement Goals: A Prospective Correlational Study**

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Most studies on antecedents and consequences of achievement goals focus on just a few constructs and there is a need for research investigating the achievement goal network more comprehensively, particularly using longitudinal designs. The aim of the present study was to provide a stricter test of theorizing on antecedents and consequences of achievement goals. To this end, we investigated students’ implicit theory of intelligence, achievement motives, and perceived competence as antecedents of their achievement goals and, as possible consequences, their intrinsic motivation and academic achievement in a prospective correlational study. Participants were 288 high-school students with a mean age of 17.74 years. Data were collected using questionnaires that were administered with a time gap of one year. At Time 1, students indicated their implicit theory of intelligence, hope of success, fear of failure, and perceived competence. At Time 2, students indicated their achievement goals and intrinsic motivation. Subsequent grade point average served as criterion for academic achievement. Data were analyzed using structural equation modeling. Incremental theory and perceived competence positively predicted mastery goals. Achievement motives and perceived competence positively predicted performance-approach goals. Fear of failure, but neither incremental theory nor perceived competence predicted performance-avoidance goals negatively. Mediation analyses revealed significant indirect effects of students’ distal motivational characteristics on their intrinsic motivation and academic achievement via achievement goals. Findings corroborate the conceptualization of implicit theory of intelligence, achievement motives, and perceived competence as antecedents of achievement goals, but also raise questions regarding the foundations of performance-avoidance goals.

**Avoiding failure at University: when high performance is not enough for low status students**

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Research on achievement goals (Elliot, 2005) has demonstrated that one of the main predictors of students’ performance-avoidance goal endorsement (i.e. trying to avoid performing poorly) is previous performance (Senko & Harackiewicz, 2005): the better one’s performance, the less s-he endorses performance-avoidance goals. We argue that socio-economic status is an antecedent of performance-avoidance goals adoption and a moderator of the relationship between previous performance and performance-avoidance goals. Three studies were conducted in a real classroom context, with a measure of performance-avoidance goals in one’s studies (Study 1), in one’s class (Study 2 and 3) and in one’s exam (Study 3) and with various measures of previous performance. Results showed that low status students reported a higher level of performance-avoidance goals than high status students. Moreover, for low status students, a high previous performance is not sufficient to reduce the endorsement of performance-avoidance goals. Theoretical and practical implications are discussed.

Pupil’s Multiple State-Goals as a Function of Situation, Person and Situation x Person

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More and more often, dynamic and situated approaches are applied to the field of motivation as well as goals. However, not much is known about the genesis of state goals in authentic classroom situations. The Model of Adaptive Learning (MAL; Boekaerts & Niemivierta, 2000) proposes trait goals, situational appraisals as well as person x situation interaction to predict state goals. Nevertheless, empirical evidence on basic assumptions of the MAL is inconsistent, i.e., not yet covering all aspects. This paper surveys the basic assumptions of the MAL regarding genesis of state goals by trait goals, situational appraisals, as well as their interaction in authentic classroom learning episodes. Based on longitudinal data with one trait- and two state-measurements (N=542) three different effect models are tested by means of structural equation models with latent variables: an additional effect model, a reactive effect model, and an interaction effect model. Results indicate that the joint influence of trait goal-components and appraisals on state goal-components is not unitary, but multiform: linear as well as multiplicative relations of trait goals and situational appraisals explain the genesis of state goals. Based on our data, the reactive hypothesis has to be rejected since trait goal-components do not impact situational appraisals in actual learning episodes. As state goals are basically essential regarding proximal learning behavior, the results are important for theory development as well as practitioners.

Predicting teachers’ promotion of self-regulated learning by teacher beliefs

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We examined the impact of three different aspects of teacher beliefs on their promotion of self-regulated learning (SRL) in the classroom: We assessed teacher beliefs on (1) instructing SRL, (2) regarding their own self-efficacy with regard to the promotion of SRL, and (3) teachers’ epistemological beliefs regarding learning, and we examined their predictive values for teaching behavior regarding SRL. Data on 173 primary school teachers were included in the analyses. Teachers were asked to complete a questionnaire consisting of three scales that assessed the abovementioned three types of teacher beliefs as well as a questionnaire measuring their promotion of SRL. Multiple regression analyses revealed that measures for teachers’ beliefs on instructing SRL, and for beliefs of self-efficacy regarding the promotion of SRL, were predicting teachers’ promotion of SRL in the classroom positively. With regard to teachers’ epistemological beliefs, only the subscale measuring whether learning skills are innate, turned out to be a positive predictor for teacher behavior, while the subscale measuring whether learning behavior is changeable, did not predict teachers’ promotion in the classroom. The results offer new insights in teacher beliefs and how they might account for teacher behavior regarding the promotion of SRL. Moreover, the results indicate that teachers need a positive attitude towards the instruction of SRL, satisfactory self-efficacy regarding the instruction of SRL, and the attitude that learning abilities are not inherent, in order to promote SRL in their classrooms. Interventions to help teachers promote SRL in their classrooms should focus on these aspects.

Electronic portfolios enhancing students’ self-directed learning: A systematic review

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Electronic portfolios can be used to develop students’ self-directed learning skills; i.e. assessing one’s own performance and setting goals for improvement. This study is aimed to identify encouraging and discouraging factors stimulating the development of self-directed learning skills when using an electronic portfolio. Method. A systematic review was conducted. Web of Science (WoS) was used to search through the Social Sciences Citations Index (SSCI) and the Science Citation Index (SCI). Our search was restricted to include only results from the previous ten years, using the following search terms portfol* and learn*. Four inclusion criteria were used. Firstly, studies dealing with portfolios. Secondly, the portfolios had to be of an electronic nature. Thirdly, the studies had to deal with the development of self-directed learning. Lastly, the studies had to report empirical data. Results. 420 articles resulted from the search. Abstract review yielded 68 articles for full-text review. After full-text review 15 articles were included that met all four inclusion criteria. Systematic reviewing revealed the following categories of influential factors: Personal factors, portfolio factors, intervention factors, support factors and institutional factors. Conclusion: Level of coaching and provision of feedback are important support factors enhancing the development of self-directed learning skills when using an electronic portfolio. The degree to which the portfolio emphasizes student’s responsibility for their learning (e.g. encouraging students to self-assess their performance)
Initiatory but not inhibitory self-control predicts academic achievement in children

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Children’s self-control has been identified as a key mechanism in early academic achievement in both preschool and elementary school. Self-control involves replacing an undesired behavioral tendency with another behavior that may be more effortful, but also more suitable to meet situational demands. Recent research distinguishes two aspects of self-control, namely inhibiting an undesired behavioral tendency (inhibitory self-control) and initiating an effortful behavior (initiatory self-control) (De Ridder et al., 2008). The aim of the present research was to explore the contributions of inhibitory and initiatory self-control to early academic achievement in preschoolers and elementary school students in a cross-sequential design. Participants were N = 127 children in their last or next-to-last preschool year (M Age = 5.63 years, SD = 0.60; 52% girls) and N = 80 third-graders (M Age = 8.48 years, SD = 0.47; 45% girls) from Germany. Inhibitory and initiatory self-control were measured using two subscales derived from the Brief Self Control Scale (Tangney et al., 2004). Children’s early academic achievement was assessed using direct assessments for preschoolers and report card grades for third-graders. Preliminary findings indicate that initiatory self-control contributes substantially to children’s academic achievement, with children who showed stronger initiatory self-control performing higher. No significant relations of inhibitory self-control to academic achievement were detected. This highlights the theoretical significance of the distinction between the two self-control components for educational research. Practical implications will be discussed, placing a special focus on interventions designed to improve children’s self-control.

Goal-setting behaviour in Massive Open Online Courses

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Massive Open Online Courses (MOOCs) represent a new and increasingly popular model of online learning course where the learner’s ability sets their learning goals and the emphasis is on creating new knowledge rather than on ‘working through structured course materials’. This study set out to
investigate the skills and attributes learners need to possess to participate effectively in a MOOC, and in particular: ‘How do participants plan and reflect upon their learning goals within the Change 11 MOOC?’ Participants for this primarily qualitative study were recruited from the Change 11 course cohort. Participants were first invited to complete a self-report instrument to establish a measure of their self-regulation. Semi-structured in-depth interviews (n=27) exploring goal-setting and other learning behaviours were then conducted. Anonymised interviews were analysed and a combination of pre-defined and emergent codes used to categorise the data. Interview data was then analysed against the SR scores derived from the survey instrument. Findings from the study highlight that learners with different self-regulated learning profiles differ in their approach to goal setting and learning in a MOOC, but that other factors are also important with the topic and precise format of the course in particular mediating individual approaches to goal-setting. These findings can help practitioners design more supportive learning environments and learning designs which take account of different learner approaches to goal-setting in MOOCs which, while presently under-researched, are rapidly gaining prominence as a mechanism for delivering learning online.

**Teacher’s Pedagogical Content Knowledge and Instructional Behaviour in Reading**

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Scholars agree that turning our students into successful readers demands for both a high quality reading instruction and a vast body of specialised knowledge. However, possessing a high level of knowledge in itself does not seem to guarantee that teachers use this knowledge in designing their reading instruction. In this study we will explore the relationship between teachers’ pedagogical content knowledge on reading and the quality of their reading instruction. The study was done with a sample of 452 teachers in primary education. A low but significant \( \gamma \)-coefficient of .18 has been found for the relationship between pedagogical content knowledge and instruction behaviour in reading lessons. This result makes clear that high quality reading instruction depends only for a very small proportion on teachers knowledge level of reading. As a consequence focus in pre- and in-service teacher training should not be limited to transfer of knowledge but probably also address teachers’ application of this knowledgebase in developing reading instruction.

**Long term effects of a phonological training study on early reading skills**

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Several studies have shown that training of phonological abilities prior to the beginning of reading instruction has positive effects on early reading acquisition. The phonological training has to be
explicit and structured, and it seems to be even more efficient if combined with training of phonemegrapheme correspondences. In Sweden formal reading instruction starts at the age of seven, and the phonological training is usually implemented when children are six years old. One aim of the current study is to examine the effect of phonological training which starts when children are four years old. A Swedish phonological training program has been developed and implemented three years before formal reading instruction takes place. The intervention group (n=139) received one wave of phonological training 25 minutes per day for six weeks in small groups when children were four years old, and an additional wave of training at the age of five. The control group (n=83) received non-phonological training under corresponding circumstances. When children were six years old, both groups took part in ordinary phonological training activities in their kindergarten. Structural equation modelling gives the opportunity to examine relations between verbal and reading related tasks between groups and over time. Preliminary results indicate that the intervention group outperformed the control group on phonological and reading related tasks. The poor performers benefitted the most from the intervention.

Improving reading skills in primary school: Which type of intervention works for whom?

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Different types of reading interventions have been proposed to improve reading skills in primary school. Phonics instructions, trainings of reading fluency, and trainings of reading comprehension are known to be effective overall but little is known about the cognitive skills children should possess to benefit from these very different types of reading interventions. Based on a cognitive perspective on reading comprehension, this study investigated aptitude-treatment interactions of component skills of reading and the three reading interventions. Poor readers from grade two (N = 235) participated in an experimental study with pre- and post-tests. We found significant interactions of treatment and syntactic parsing: Accurate syntactic parsing was a prerequisite for poor readers to succeed in any of the three reading interventions. In addition, word recognition skills moderated the effectiveness of the fluency training and the strategy training. Students with efficient word recognition could benefit from the strategy training but not from the fluency training which worked best for students with inefficient word recognition. The results suggest that reading interventions are most likely to be successful if they take into account the specific cognitive deficits of the individual reader.

Synthesizing information during online reading and writing a joint argumentative essay
This study explored how student (ages 16-18) pairs synthesized information when they collaboratively read online and composed an argumentative essay. Understanding how synthesis takes place online is important because many different points of view appear and are rapidly accessible. First, the pairs (n=12) discussed the topic and constructed an argument graph, with boxes for each item, on the basis of their prior knowledge. Second, they searched for additional information on the Web and modified their graphs. Finally, they composed their joint essay. Data came from: argument graphs, interaction protocols, screen captures, and students’ joint essays. The origins of argument boxes in the graph were categorized as well as the links between the boxes. Students’ essays were divided into idea units and the origin of each idea unit was tracked and categorized as: a) prior knowledge, b) Web source or idea generated through discussion during reading, c) writing, or any combination of these three. Students’ graphs included, on average, 21 argument boxes. Of these, 46% were based on prior knowledge, 39% on online sources, and 15% on ideas generated through discussions during reading. In their graphs, more than half of the links (59%) involved prior knowledge. Most of the ideas (87%) in the graph were included in the essays. Most of the idea units (M=47.1) of the essays originated from online sources or discussions during reading (32% of all idea units), writing (24%) or prior knowledge (19%). These results suggest that the students utilized different information sources in a versatile way.

Building content during writing

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This paper will describe a novel method of combining process analysis with product analysis in writing research (Baaijen, 2012). It will demonstrate how this can be used to clarify the different processes involved in the development of understanding during writing, and suggest that two different processes, an explicit planning process and an implicit text production process, are involved. The key feature of the method is that it assesses when new content is produced during writing rather than just how much a writer’s ideas change as a consequence of writing. It will discuss how the general principles of the method might be applied to a range of other questions in writing research, and consider the implications for the use of writing as a tool for learning and for the teaching of writing.
Quite a number of studies on the effects of observational learning in writing education have been published both in L1 and in L2. In the majority of these studies students observe instructional video clips of peer models performing a new writing task while thinking aloud. However, no studies on observational learning have explored features of the instructional video itself. In the present study we investigate what the effects are of a first letter mnemonic of a writing strategy in an instructional video on undergraduates’ self-efficacy beliefs, task knowledge and writing performances on a synthesizing task. A total of 200 Business undergraduates were randomly assigned to one of two observational learning conditions. In Condition 1, students watched a peer model verbalize and explain the different steps of a strategy for writing a synthesis task. In Condition 2, students saw the same video; only now visual aids to trigger and improve attention and retention of the different steps of the strategy were inserted in between every step of the writing process. Statistically significant differences were found between the two learning conditions for self-efficacy, task knowledge and writing performance. The results seem to suggest that in a strong instructional environment, when designing instructional videos with peer models for a new and complex writing task instructional devices to facilitate information-processing and retention are of paramount importance.

The moderating effects of writing beliefs on the effects of writing strategies

White and Bruning (2005) identified two independent sets of beliefs about writing, transactional beliefs and transmissional beliefs, and suggested that they are associated with important effects on writing performance. This paper describes an experiment designed to investigate the effects of these beliefs on text quality and the development of writers’ understanding. In addition, we examined...
whether writers’ beliefs moderate the effectiveness of outline planning as a strategy, and compared an outline planned condition with a non-outline planned (or synthetically planned) condition. The results show that the effects of writing beliefs vary depending on type of planning. Within the synthetic planning condition, high transactional and low transmissional writers produced better quality text, and high transactional writers experienced greater increases in understanding than low transactional writers. By contrast, in the outline condition, low transactional writers produced text similar in quality to the high transactional writers, and high transactional writers were less likely to experience increases in understanding. Overall, these results confirm that writing beliefs have strong effects on text quality, and in addition suggest that they are related to the development of understanding during writing. Furthermore, they suggest that writers with more sophisticated writing beliefs may benefit less from outlining than writers with less sophisticated beliefs.

**Pausing during writing – a developmental perspective**

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This explorative study investigated the following question: What can the study of pauses during writing reveal about what writers of different ages find difficult? We analysed expository texts written by 120 participants from five age-groups: 10-year-olds, 13-year-olds, 15-year-olds, 17-year-olds and university students. The data was collected using a keystroke-logging program. All all pauses longer than 2 s were coded according to which syntactic context (word, phrase or clause) or editing that preceded the pause. The pausing time in each context was then related to the total pausing time during the writing session. Analyses of other pause contexts reveal interesting developmental patterns. The 10-year-olds seem to struggle with spelling, indicated by more pause time within words. The 13-year-olds and 15-year-olds spend little pause time in any context, except the clause boundaries, which may indicate that they are knowledge tellers. The 17-year-olds may be entering the state of knowledge transformers, indicated e.g. by being very occupied with pausing and editing in the middle of phrases. The adults spend a high proportion of their pause time to editing. This study shows that pause analyses can shed lights on the current learning processes that the writer is struggling with. Writers at different developmental levels may find different things difficult.

**How Well Can Teachers Diagnose Student Subjective Well-Being?**

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The study focuses on teachers’ ability to diagnose students’ subjective well-being. Grounded in the multi-dimensional model of school well-being by Hascher (2004), forty-four teachers were asked to judge students’ positive attitudes towards school, enjoyment at school, positive academic self-concept, absence of worry about school, absence of social problems in school, and absence of physical complaints in school. Teachers’ judgments were related to the self-reports of 800 eighth-grade secondary school students. Results show that teachers can capture positive aspects of student well-being with higher accuracy than negative ones. The reason may be that students in general report about high well-being at school. However, especially in case of problems, there is still a considerable potential for improvement because teachers are hardly in a position to diagnose the physical, social, and psychological problems of their students appropriately.

Pre-service teachers’ beliefs about their own and students’ science learning process

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The position taken in this research is that insight in pre-service teachers’ beliefs of teaching and learning is a requirement for attempts of changing teachers’ behaviour. We assume that the way in which pre-service teachers prefer to learn science themselves is related to their beliefs of how students should learn science. Therefore the aim of this study is to compare teachers’ beliefs about students’ learning and the beliefs teachers’ develop about their own learning processes. The results of this study are based on data from 252 pre-service science teachers who completed two questionnaires. The TraC-questionaire measures the dimensions transmissiv and constructivistic in a general way. The CoP-questionaire deepens the constructivist dimension and focuses on the domain specific dimensions connectivity and pre-concepts. The items in both questionnaires cover the perspective of students’ learning and of the preservice teachers’ own learning. In both instruments all factors can be separated clearly in both perspectives. Our results indicate that pre-service teachers prefer for both themselves and their pupils a constructivistic learning process and facilitate connectivity and the integration of pre-concepts into their own learning process and the learning process of their pupils. The approaches that teachers favour when teaching science seem to be very similar to those preferred when they themselves are learners. Still teachers’ general constructivistic beliefs about their students’ way to learn differ from their beliefs about their own way of learning, the domain-specific beliefs about students’ way of learning and their own learning processes however are strongly related to each other.

Assessing Professional Vision of Classroom Management – Validation of a Video Test

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Many studies indicate a great impact of classroom management on students’ learning outcomes, active participation in the classroom and the mental health of teachers. Consequently, the early development of appropriate classroom management skills is important for novice teachers. One aspect of classroom management skills is the observation and interpretation of classroom interactions in order to derive appropriate consequences for learning, teaching and instruction. The aim of the study is to construct a standardized, video-based test to assess such professional vision of classroom management including the main aspects of classroom management, namely Withitness, Organizational Structuring and Rules and Routines. The video test was composed of five short classroom video clips and corresponding text items about classroom management shown in the clip. Because each item is nested in a video clip, a bifactor model was calculated to examine the construct validity and to investigate mean differences between novices, pre-service teachers and in-service teachers. In the pilot study, the bifactor model reached a good fit to the data (RMSEA = .05, CFI = .95, TLI = .98). In-service teachers (N = 96) reached the highest and novices (N = 75) the lowest mean in the video test with the pre-service teachers (N = 94) in between. These results could be replicated in a validation study (RMSEA = .05, CFI = .94, TLI = .97; N = 434). Findings indicate a satisfying construct validity and sensitivity for expertise differences of the video test, with which training effects of courses for pre-service teachers or workshops for in-service teachers could be assessed.

Systems of integration: Using system dynamics to understand technology integration in teaching

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This paper presents the use of system dynamics to analyze factors impacting on teachers adoption and integration of technology in learning and teaching. Educational change is a complex and dynamic process, particularly in the area of technology integration. Existing models of teacher integration have not been designed to account for shifting and changing teacher experience, confidence and cultural aspects of technology integration. Therefore, the use of system dynamics is proposed to provide a more informed understanding of these interactions, with the aim to extend existing models of teachers’ technology integration. This discussion applies this approach to analyze and model teachers’ adoption of laptops in teaching within a large-scale 1-to-1 laptop program in New South Wales, Australia. The research is novel and innovative in its use of system dynamics to understand teacher change. Implications for professional development and school-level support will be discussed.

How do teaching career intentions develop through practice teaching?

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Recently, teaching career decision process is becoming a more important topic. The present study aims to explicate a relationship between teaching intentions and the explanatory variables such as expectations for practice teaching, impressions of practice teaching, beliefs on learning and instruction, and teaching motivations in a long term perspective. Two hundred and ten Japanese students filled out questionnaires before and after practice teaching, that was held in the midst of their third year, and in the beginning of their fourth year. It was found that teaching motivation, expectations for practice teaching, and impressions of practice teaching would differentially determine teaching intentions depending on the measurement timing. Model exploration with structural equation modeling method suggested that teaching intention can properly be explained in a long-term perspective. The findings shed light on the importance of examining the dynamic variables related to learning activities, rather than focusing only on static variables such as teaching motivations.

The Motives: Gender (A-)Typical Career Choices of Young Women and Men

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Within the last decade, numerous reforms targeted the improvement of teacher education at university as well as teacher preparation as a way of bridging the gap between university and the teaching profession (Cochran-Smith 2005). Using the example of the modularization of the teacher induction program in the German constituent state of Hesse, this paper examines effects of structural reform on educational processes in teacher induction and self-assessed competency of newly qualified teachers (NQTs). From 2004 through 2008, the German Institute for International Educational Research assessed all teacher induction institutions in Hesse once before and once after the reform, examining qualitative and organizational preconditions of the induction program. The sample includes 4,203 NQTs. The theoretical model underlying the study is a basic input-process-output model. This is combined with the general idea that educational outcomes are based on processes of supply and utilization. The paper examines the effect of educational processes within teacher induction and modularization on self-assessed instructional competency of NQTs. In order to analyze these interdependent effects, a structural equation model is estimated. Separate estimations are computed for NQTs specializing in primary, lower and higher secondary education. The results show that utilization of opportunities to learn (OTLs) and phase within the program have the greatest effects on instructional competencies for all tracks, while significant effects of modularization on utilization of OTLs varies for school tracks. Mediated effects of input and supply variables on competency via utilization are found. Possible starting points in increasing instructional competency are discussed.
Since a couple of years practice-based teacher education is focusing an increasingly wide range of dimensions of professional action. There is evidence that traditional approaches of field experiences often fail to create a sustainable professionalization. There are three areas which are in need of development: 1. integration of academic and practitioner knowledge, 2. ability and willingness to cooperate in communities of practice, and 3. focusing on student learning. Therefore the University of Teacher Education Northwestern Switzerland initiated the implementation a project which faces these deficiencies by establishing university-school-partnerships to create hybrid spaces in which pre-service and mentor teachers cooperate in communities of practice. The related design-based research project analyses with quantitative and qualitative methods, to what extent 1. the theory practice gap can be bridged, 2. cooperation in school-based communities of practice can be promoted, and 3. what effects the intervention has on focusing student learning, during the project duration in comparison to a control group. First results indicate that cooperation an focus on student learning tend to increase whereas the integration of academic and practitioner knowledge does not decline. Final results are expected until summer 2013.

Developing ‘good’ post-primary teachers and teaching in a reform era: cultural dynamics in a program

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Drawing on findings from two-mixed methods (artefact, survey and interview data) studies, the Learning to Teach Study (LETS, 2007-09) and Re-imagining Initial Teacher Identity and Learning Study (RiTILS, 2011-13), we focus on the cultural dynamics of programme level teacher education design and enactment. Framed via sociocultural theory, findings centre on three themes: (i) mentoring without access to observation of others and the ‘invisible learner’ phenomenon (ii) Inherited ‘good teaching’ cultural scripts dominate over reform-oriented images of teaching and (iii) student teachers reported feeling ready to teach but not ready to ‘do’ inclusion. Findings are discussed in terms of programme design given current major reforms of initial teacher education internationally.

Learning to regulate from peers? An analysis on peer tutoring groups’ metacognitive regulation

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Although new perspectives on learning and metacognition highlight the facilitative nature of collaborative learning and shared knowledge construction when promoting metacognitive regulation, little is known about the occurrence of metacognitive regulation behaviour in collaborative settings. The present study investigates evolutions in reciprocal peer tutoring (RPT) groups’ metacognitive regulation by analysing peer interactions and therefore contributes to both the emerging research on social regulation and to process-oriented studies on tutoring. Both evolutions in the frequency of occurrence and in the approach to regulation are studied. Seven RPT-sessions of five randomly selected RPT-groups were videotaped (+/- 70 hours) and analysed with a literature-based coding instrument on metacognitive regulation in collaborative settings. Differences over time in groups’ regulation behaviour were analysed by means of binary and multinomial logistic regression analysis. Results reveal RPT-groups’ significantly increased involvement over time in metacognitive regulation. RPT-groups, more specifically, engage significantly more in metacognitive orientation, monitoring, and evaluation as the RPT-intervention progresses. RPT-groups’ limited planning behaviour remains, however, stable throughout the RPT-intervention. Notwithstanding RPT-groups’ permanent involvement in low-level regulation, deep-level regulation strategies are adopted significantly more frequently as the RPT-programme progresses.

Implementation fidelity, responsible teaching and sustainable learning

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The paper addresses the theme ‘Responsible Teaching and Sustainable Learning’ through reflecting on the quantitative, qualitative and process findings of an independent randomised controlled evaluation of an intervention programme to promote social-emotional learning (SEL) in children of primary school age (four to eleven years of age) in the UK. The SEL programme, PATHS (Northern Ireland) was an adaptation of Promoting Alternative Thinking Strategies (PATHS), developed and evaluated in the US. The paper describes the design, methodology and findings of the randomised controlled evaluation. It then focuses on five aspects of implementation fidelity as a lens to identify features of responsible teaching and sustainable learning found to be associated with SEL programme delivery in the evaluation. The paper argues that using implementation fidelity as a second-tier analytical approach provides an important additional dimension to understanding important mechanisms underpinning the educational effectiveness of SEL programmes. These mechanisms include adherence, exposure, quality, teacher and pupil responsiveness, and differentiation. The paper concludes that the interrelationship between implementation fidelity, responsible teaching and sustainable learning may usefully enhance our understanding of educational effectiveness.

Changing unsafe behavior on social network sites: cooperative learning vs. individual reflection

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Media education at school has been put forth as a possible solution for the growing concerns about children’s behaviour on online social network sites (SNS), that brings about risks such as cyberbullying, sexual solicitation and invasion of their privacy. However, existing research shows that while an increase in knowledge is often obtained by education in schools, it is much more difficult to obtain a change in attitudes or unsafe behaviour (Martens, 2010). The theory of planned behaviour (Ajzen, 1991) states that the ‘social norm’, i.e. the opinion of significant others, is an important predictor of this behaviour. In this case, peer pressure might cause a lack of change in attitudes and behaviour since sharing personal information is social desirable. Therefore, cooperative learning might be counterproductive in changing SNS-behavior, and an emphasis on individual reflection might increase the impact of school education. To verify this hypothesis, a quasi-experimental intervention study was set up in secondary classes, comparing the impact of a lesson about risks on SNS emphasizing cooperative learning and the impact of a lesson emphasizing individual reflection with a control condition (no lesson). It was found that, while both courses had an impact on the awareness of contact risks on SNS, only the lesson with an emphasis on individual reflection had a positive impact on attitudes and behaviour, as compared to the control condition. These results implicate that individual reflection should be encouraged in prevention campaigns about safer use of SNS.

**Students’ learning within a content management-supported learning environment: Is timing everything?**

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Although content management systems (CMSs) are worldwide very popular in higher education, little is known on how students profit from these CMS supported learning environments. The current contribution addresses this shortcoming and investigates how students use the available CMS tools within a CMS supported course. Based on phase theories of learning, the study approaches students’ tool-use from a temporal perspective i.e., the way students regulate their tool-use throughout the course. Logging students (179) use of multiple CMS tools and registering students’ use of the face-to-face tools, results revealed that students differed in their tool-use in terms of the tools that students selected and the way these tools were used. Additionally, all students regulated their tool-use throughout the course although only a minority was able to regulate their tool-use in line with the learning phases. Interestingly, the latter was found to be more adaptive for students’ learning. These results provide perspectives for instructional design and for research on self-regulation.
Computer-supported Open Learning Environments: a Multiple Cases Study in Italian Secondary School

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The study analyzes how the concept of computer-supported open learning environment (CS-OLE) evolves in a mathematics curriculum from written documents to actual implementation in the classes, enhancing our understanding on how teachers tackle CS-OLE to support mathematical problem solving in Italian first degree secondary school. The study consists of two main parts. First, we analyze how mathematical problem solving and the concept of CS-OLE are treated and suggested for implementation in the Italian mathematics national curriculum. Second, a multiple cases study (consisting of four cases) clarifies aspects of the mathematics curriculum processes for Italian teachers who endorse the notion of CS-OLEs and have the explicit intention to work with this notion as a way to support problem solving.

Computational Scientific Inquiries: New Ways of ‘Doing’ Science to Learn Science

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The research discussed in this paper explores a learning design we refer to as computational scientific inquiry in which learning occurs with experiences enabled by the virtual learning technologies that reflect culturally authentic practices in modern science. We describe the agent-based virtual world (ABVW) technologies we developed and the results of the initial classroom study involving this approach. Significant learning of important components of scientific inquiry and positive qualitative experiences were found. The paper concludes with a discussion of the implications of this approach as well with suggestions for future research involving virtual and game based experiences in science education and other subject areas.

Emotional competence in elementary years: Expressing, understanding, and regulating emotions

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Considering the pervasiveness of achievement emotions in school, research recently focused on them and documented differences between contexts in terms of subject-matters or settings. However, to our knowledge few studies have involved elementary school students on the prevalence of achievement emotions and their relationship with other components of emotional competence, in terms of ability to express, understand and regulate one’s own and others’ emotions. The present study focused on the development of emotional competence across elementary school years, taking into account students and their significant adults like teachers and parents. Participants were 166 Italian first, third, and fifth graders, their parents, and their Italian and mathematics teachers. They were administered three instruments to measure expression of achievement emotions (a questionnaire adapted from Pekrun, Goetz, Frenzel, Barchfeld, & Perry, 2011), emotion understanding (TEC, Test of Emotion Comprehension, Pons & Harris, 2000), and emotion regulation (ERC, Emotion Regulation Checklist, Shields & Cicchetti, 2001). Decreases in children’s expression of positive achievement emotions and increases in children’s understanding and regulation of emotions across elementary years were found. Differences between settings and subjects emerged and higher similarity was found between children’s and parents’ emotional evaluations than between children’s and teachers’. Strong relationships between the three different components of emotional competence were found. These data, together with the prevalence of positive valence, should encourage devising interventions which, taking into account specificity of different contexts at different school levels, can detect students’ emotional constructs to promote their subjective wellbeing.

Teachers’ perception of the school goal structure: Relations with goal orientation and engagement

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Research on goal theory has almost exclusively focused on students’ goals and their perception of the classroom goal structure. The purpose of this study was to explore relations between teachers’ perception of the goal structure of the school where they were teaching, their goal orientation, and their engagement for teaching. The participants were 2569 Norwegian teachers in elementary school and middle school. Data were analyzed by means of structural equation modeling (SEM). Perception of mastery and performance goal structures was negatively but close to zero correlated. The teachers’ personal goal orientations corresponded with their perceptions of the school goal structure. Mastery goal structure was positively related to engagement, both directly and indirectly through goal orientation. Performance goal structure was not directly related to engagement. However, it was positively related to both performance-approach and performance-avoidance orientation. These orientations were differently related to engagement. Performance-approach orientation was positively related to engagement whereas performance-avoidance orientation was negatively related to engagement. These effects equalled each other out resulting in a close to zero correlation between performance goal structure and engagement.

Happiness decreases in junior high school. A follow-up study on 12- and 15-year-old Finnish students

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Global and school-related happiness were measured in more than 700 sixth graders and, three years later, in more than 300 ninth graders. Students filled two questionnaires, the Subjective Happiness Scale (Lyubomirsky & Lepper, 1999) and the School Children’s Happiness Inventory (Ivens, 2007). In addition, students chose from a given list items that they perceived would increase their happiness. Sixth graders were happier both globally and in the school-context than the ninth graders. Especially in the girls, happiness had declined rather dramatically during the junior high school years. Decrease in happiness was mostly attributed to being bullied, lack of friends and stress in the school. In the sixth graders, the most wanted choices for happiness increasing items were better success in school, more free-time, more money and a girl- or a boyfriend. Three years later, better success in school still was the most appreciated factor followed by a wish to have more money, more free time and a girl- or a boyfriend. In the sixth grade, those in the lowest quartile on global happiness scale more often than others wanted to have a peaceful family life, more friends and better looks. In the ninth grade, the globally unhappiest more often than others wanted to dare to be themselves, to have better looks, a girl- or a boyfriend and clear future plans. The ninth grade girls with a high grade-point average were happier than other girls both globally and in the school. Among the ninth grade boys, no such differences appeared.

**Factors Impacting the Motivation of German and U.S. Teachers to Become School Principals**

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In Germany and the United States, effective school leadership is critical to a school’s success. Although the preparation and responsibilities of German and U.S. school leaders differ in many ways, the challenge of recruiting and retaining qualified school leaders is similar in both countries. In the following synopsis of the full paper, researchers summarize findings from two recent quantitative/qualitative studies regarding individuals’ motivation to become school leaders. The full paper presentation of these results during the 2013 EARLI Biennial Conference will explain in detail the findings of these two studies and how they contribute to the recruitment and development of school leaders in both the U.S. and Germany.

**Learning Trajectories in the Suburbs of Oslo; Diversity, Identity and Educational Aspiration**

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Drawing on empirical data from a project (2009-2013) exploring ‘learning lives’ among pupils in the high-rise suburbs of Oslo, this paper highlights how two contrasting groups of students position
themselves as learners differently in regard to educational aspirations and engagement in school. The study draws on a three wave longitudinal survey (2006/2008/2010, N=2328-1855, conducted by a collaborative partner, NOVA) and a year long ethnographical fieldwork following the same cohort, born in 1992. Findings in the survey identify boys with both parents born in Norway and girls with both parents born in Pakistan (Pakistani heritage) as two highly contrasting groups in regard to educational aspirations and interest into lower secondary education. Based upon the fieldwork, were the students are followed closely for more than a year, it is argued that both of these groups have obstacles and barriers to achieving their educational goals as learners. The paper shows how these two groups negotiate these challenges and illustrates how their learning trajectories are related to their identity construction in the transition from school to higher education and working life (Biesta & Tedder, 2007; Thomson, 2009). The findings have implications for understanding learning trajectories among students in the Norwegian society, which have become more culturally and linguistically diverse during the last decade. Bringing the knowledge back to teachers and supervisors, the findings are of importance for counselling students in their educational trajectories, in particular in the transition between lower and upper secondary schools in Norway as well as other countries.

Enhancing vocational students intercultural sensitivity through the Group Investigation approach

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The article reviews the use of cooperative learning, as a way to promote intercultural education in secondary schools. Within Italian formal education contexts cultural diversity is associated to a threat and a danger by a significant part of the youth population. Working with Group Investigation can be instrumental in facilitating the development of improved communication and collaboration within the school environment in relation to the study of the curriculum and to enhanced open views in relation to cultural diversity.

Diversity in Schools and Minority Teachers’ Professional Action in Germany

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A promising way to deal with the achievement gap between migrant and nonmigrant students seems to be the engagement of more teachers with migration background. The hope that is associated with the call for more minority teachers is that they can deal with diversity issues more adequately and professionally. Not only students, but also the faculty and the school as a whole are believed to benefit from the employment of minority teachers (Strasser & Steber, 2010). Up to now, no or little
evidence has been established that supports this hope. In order to explore the conditions for successfully realizing the supposed positive impact, the paper focuses on the routines and activities of minority teachers within their classrooms. It is assumed that a positive effect of immigrant or minority teachers occurs not by their mere presence but in interaction with specific constraints and affordances of their professional context.

**Perspectives on the recruitment of ethnic minority teachers by migrant students in teacher education**

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One strategy to reduce the disadvantage of migrant students in school, discussed by educational policy, is the recruitment of teachers from minority ethnic groups. The aim of this study is to contrast the educational policy and its belief in ‘integration and social cohesion through specific recruitment’ with perspectives voiced by migrant students in teacher education. Our research questions are: Which kind of discrimination have the teacher trainees experienced in school and which role does language play in it particular? How do they anticipate their ascribed roles as mediators of language and culture? Which chances and barriers do they see? We selected focused group discussions to explore the students’ attitudes, because this method is particularly suitable to discover and to show in detail collective patterns of orientation and to reveal private opinions which are not (openly) discussed in public. On the basis of our sample with 15 migrant teacher trainees the results can be summarized as follows: the perceptions of the teacher trainees show that the monolingual habitus they experienced reveal ambivalent perspectives on the use of their own plurilingualism and the deviance from the monolingual norm. They have also ambivalent views of their future roles as mediators of language and culture. They feel at an advantage compared to native students. Then again, they refuse to simply be reduced to that role.

**Agent-based Virtual Environments for Computational Inquiry: A Demonstration**

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Charlotte Taylor  
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This session will demonstrate two technology systems developed by our research team that support computational inquiry: Omosa Agent Based Virtual World (ABVW) and Omosa NetLogo Model. The Omosa ABVW is a 3D immersive learning environment that supports the learning of science inquiry skills and scientific concepts about a predator-prey ecosystem. The Omosa NetLogo model allows students to do computational experiments. Each of these systems will be demonstrated and a general overview of the school-based research conducted with these systems will be provided.
Qualitative Content Analysis Program QIAPro – an open access text analysis software

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An open access web based software program is demonstrated which is directly based on techniques of Qualitative Content Analysis (Mayring 2010). Those techniques aim at a systematic, rule-guided and inter-subjective analysis of textual material (interview and group discussion transcripts, open questionnaire material, observation protocols and field notes, documents and files). The software program leads, as an interactive tool, through the several steps of inductive category development and deductive category assignment. It presents pre-structured templates following the several steps of analysis. It is combined with explicit descriptions of the procedures and their theoretical background. The program as well as the handbook is approachable in open access (www.qiapro.com).

Knowledge in Motion across Contexts of Learning (KnowMo)

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There is a lot of attention on challenges in schools concerning motivation and dropout rates, especially in secondary schools. Still, there is uncertainty on why this is so and how teachers relate to
such challenges. The KnowMo project focuses on how teachers handle the flow of information and experiences from different contexts that students bring to the classroom and between formal, non-formal and informal ways of learning. The aim of the KnowMo project is to study the conditions under which learning experiences in out-of-school settings can be made relevant for learning in secondary schools, and how teachers can draw on students informal knowledge in the school work.

Towards Combining Collaborative and Individual Learning with a Tutoring System for Fractions

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Classroom instruction often involves both individual and collaborative modes of learning. Both of these modes of learning have been shown to be highly effective in prior research. Yet there is surprisingly little scientific knowledge about the ways in which these learning modes complement each other, or how best to combine them. We are embarking on a new research project in which we will address these two research questions. We will conduct a lab study and two classroom studies. As platform for the proposed research, we will use the Fractions Tutor, a web-based intelligent tutoring system for 4th and 5th-grade students that we created in our prior work. This tutor has proven to be effective in helping students learn about fractions in four classroom studies with a total of 3,000 participating students. For the proposed research, we will adapt this tutor for use by networked dyads collaborating and communicating via chat or speech. Students’ procedural fluency with, and conceptual knowledge of fractions, will be assessed prior to the intervention, directly after the intervention (to assess learning gains), and about one week after the intervention (to assess retention). In addition to the test data, we will collect tutor log data, chat or speech data, and eye movement data. The different types of data will give complementary insights into students’ learning processes. We will use the eye tracking data to analyze students’ visual attention and to gain insights into students’ cognitive processes during collaborative and individual learning.

Towards a Beer-Brewing Game: Would Gamification of an Educational Simulation Improve Learning?

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Cyril Brom
One useful but neglected approach to investigating instructional effectiveness of digital games is to manipulate presence of a game element and to compare how the game with and without the element promotes learning. The presence/absence of the very game goal is a crucial example of such an element, yet it is unknown a) when presence of a game goal is instructionally effective and when it is not, b) what type of game goal is most beneficial (or least detrimental) to learning. Here, we introduce our on-going between-subject comparative study, in which we ask a question if adding a specific type of a personally meaningful game goal on the top of a 150 minutes long educational simulation increases player’s engagement and if that, in turn, yields detectable learning gains in comparison to the simulation without the goal. In addition, we deconstruct the type of goal we employ to its two constituting elements and use a third treatment for the comparison that features just one of these elements, a personalized instruction. Finally, the study also investigates how learning effects change over time by administering one-month delayed post-tests. For the study’s purpose, we have developed three versions of beer-brewing simulation, which is personally meaningful task for many Czechs, yet details of which are generally unknown to them, i.e. low prior knowledge can be expected. We have also calibrated retention and transfer tests. The data are presently being collected with Czech undergraduate students as participants and the results should be available in June 2013.

Socially Shared Metacognition through Math Lessons in Elementary School Children

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This study investigated 6 months trajectory of first grade of children’s math problem solving of subtraction in elementary school (each first lesson of subtraction & of subtraction involving regrouping operation). Mathematics class children participated in was composed of four kinds of learning activities (role-playing, physical manipulation, group collaboration, explanation through whole discussion) supported by teacher’s constructive scaffolding. Transcripts of each statement in the lessons (ideas, questions, assessment, emotion expression, etc.) were analyzed to reveal the developmental change of children’s metacognitive participation and of teacher’s sustaining environment of learning by constructive scaffolding. Results showed that children’s learning processes of subtraction fluctuate within her/him self and between themselves through dual mode of learning by doing. Teacher’s execution of teaching phases was stable through whole lessons, and she never directed instruction interfering with children’s acts to understand, maintaining and controlling necessary sustainment in accord with children’s processes of understanding. And as children began to shift from physical to conceptual understanding, teacher would come to coordinate teaching phase adaptively.

Children’s regulation to/by others in the classroom: peer interactions in classroom discourse

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Hisashi Uebuchi
While children in school need learn socially appropriate norms, it is sometimes not easy for them to do so. Children gradually internalize the rules through frequent interactions in the classroom. Many previous studies have focused on teacher-child interactions as other-regulation. However, they tend to little look into peer interactions. Therefore, we studied peer interactions, focusing on the ways and reasons of arising other-regulations. We observed the ‘debating game’ for the third grade students. The game had some new rules that the children had to adjust to. In a quasi-experimental design, we set two conditions operated the rule of the addition score. In Condition 1, 1 point was added by remark. In Condition 2, to promote the discussion, 2 points were added just for the first remark of each child, and 1 point was evenly scored after second time. As a result of categorizing of children’s regulation-to-others, we found two sub-categories; inhibitory and encouraging. From McNemar’s test, children’s regulation-to-others appeared more in Condition 2. In Condition 2, teams with more members who made remarks received higher scores. Thus, children would work for the team and be considerate of others. From interviews with the children whom regulated-to-others, it could be due to ‘appropriation’ (Wertsch, 1979) of the teacher’s phrase in another situation. For regulation among peers, it may be important whether children have ‘metaphorical ideas’ (Hung, 2002) that would mediate the rules of classroom discourse.

Executive Functions in Integration Process of Arithmetic Word Problems: Focusing the Updating

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Recent studies have examined the relationship between arithmetic word problems and Executive Functions. It seems that updating, one of EFs, is particularly related to solving arithmetic word problems. But it is not revealed which phases of solving arithmetic word problems were affected by updating. The purpose of the current study is to reveal that integration phase of solving arithmetic word problems depends on updating. We hypothesized that problem solvers having high updating ability might not require long time to integrate an arithmetic word problem including extraneous information. Thirty-one college students solved two types of arithmetic word problems, normal problem and extraneous problem, and performed two types of updating task, phonological updating and visual updating. In solving arithmetic word problems, integration reading time was recorded. Integration reading time was analyzed with three-way ANOVA for word problem type (normal vs. extraneous), phonological updating (high vs. low), and visual updating (high vs. low). Results showed a significant interaction between word problem type and phonological updating. This result indicated that low updating problem solvers required long time to integrate a word problem including extraneous information, whereas high updating problem solvers didn’t require long time. To integrate relevant sentences, problem solvers were required to monitor current information and retain only relevant information in working memory. The results provided evidence that these processes depend on updating ability.

A mathematical modelling intervention to foster pre-service teachers’ statistical reasoning

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Primary school teachers need to have good Mathematical Knowledge for Teaching. How to train pre-service primary school teachers to teach statistics has received little attention in the literature. We present the results of a pre-test, intervention, post-test control group design intervention study in teacher education. In the intervention group we use a mathematical modelling approach to train pre-service primary school teachers in statistical reasoning (2 classes; N=50). Students work on modelling activities in which realistic problems need to be solved by developing a model that can be used to describe and explain the data. Such a mathematical modelling approach helps students to develop a deep and rich understanding of statistics and fosters their reasoning skills. The control group receives direct instruction on the same topic (2 classes; N=50). In the pre-test and post-test we measure the students’ Mathematical Knowledge for Teaching in the area of statistical reasoning. The post-test also includes two transfer tasks.

Analysis of the Relation Attitude-Achievement in Mathematics

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Affective skills are one of the determining factors of the learning process. In order to know which attitudes further determine academic achievement in mathematics, a research with a sample of 626 students (10-13 years) was conducted. The dimensions perceived usefulness, perceived competence, anxiety, intrinsic motivation and provoked feelings to mathematics were assessed. Additionally, the students’ academic performance in mathematics was registered. Multivariate analyzes of covariance indicated that the influence of these variables on academic performance is statistically significant, with slightly effect. Hence, it is concluded that negative attitudes towards mathematics do not necessarily imply a negative academic performance. This work is funded by the I+D+i project with reference EDU2010-19798, the support of a grant from the Ministry of Science and Innovation (BES-2011-045582)
A Practical Study about Mathematical Mental Representation Test for University Students

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The purpose of this study is to develop a mathematical mental representation test covering high school mathematics and to examine whether it is useful as a readiness score for university students to learn university mathematics. Participants were 79 university students in Japan. A mathematical mental representation test (MMRT) includes 19 problems concerning a sequence of numbers (4 items), vectors (2 items), a matrix (1 item), a trigonometric ratio (1 item), properties of functions (3 items), graphs of functions (4 items), differentials (2 items) and integrals (2 items). This test had problem presentation and answer selection phases. The response and RT for answer selection phase was recorded. The result of cluster analysis showed that the MMRT had different three clusters: function & sequence, geometry, and calculus for high school mathematics areas. And the results from multiple regression analysis showed significant prediction for the correct percentage and response time in function & sequence and calculus problems to the score of National Center Test. This result indicated that the learning in function & sequence and calculus areas is most important for high school students and our MMRT is useful to assess student’s achievements in high school mathematics. But our variables were not predictable for the semester examination and other variables may be more powerful.

Influence of number format in arithmetic word problem solving

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There is considerable evidence that surface form of arithmetic problems influences calculation performance. Relative to Arabic digit format (e.g., 2 + 3), written number word format (e.g., two + three) increases problem difficulty. In addition, the problem-size effect varies with surface form, with a greater effect for problems presented in written word format than in digit format, which suggests that format affects retrieval or calculation processes rather than encoding processes. These effects have been explained by a greater visual familiarity of the digit format relative to written word format. In the present study, we explored an alternative explanation: Since simple arithmetic involves that operands are converted to an internal magnitude representation, it is possible that...
Arabic digits gain faster access to magnitude representation than number words. The present study aimed to analyze this issue by effectively eliminating the potential effect of visual representations through a (addition and subtraction) word problem-solving task, which does not encourage activation of such representations. Word problems were presented word by word, at a fixed pace, using rapid serial visual presentation (RSVP). Results showed that RT was slower for subtraction than addition, slower with large than small operands, and slower for word format than digit format. In addition, the word-format cost was greater for larger than small operands, and this effect was greater in the subtraction operation. These results were interpreted in terms of influence of numerical format on stages (central or peripheral) of cognitive arithmetic.

**Fractions and decimals: The influence of format on number line estimation behaviours**

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This study investigated variations in number line estimation based on whether the target number was presented as a fraction or a decimal. It extended existing research that focuses on estimation accuracy and the logarithmic-linear shift in order to further scrutinize the link between the external and mental representation of number, we consider strategy as an influential mechanism. Typically developing children (n = 33) from Grade 5 completed two number-to-position numerical estimation tasks (fractions and decimals) on a number line ranging from 0 to 1. The magnitude of the target digits were identical in the two tasks, with only format (fraction and decimal) being varied. Participants were required to self-report their strategy use in completing each trial. Estimation of fractions and decimals were similar overall, but there were some interesting patterns when examining individual data and the self-reported strategies indicated misconceptions that may have influenced the estimation behaviour. In terms of the existing cognitive research, the consideration of strategy appears meaningful for both learning and instruction.

**A categorization of mathematic word problems by Authenticity level**

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Children’s low achievement in mathematics has usually been related to the existing gap between the problems that children solve in the classroom and the situations in which they are involved in their
everyday life (INECSE, 2006). The present work may shed some light on the length and nature of this gap. To this end, we used the framework posed by Palm (2001) to analyze certain aspects of word problem solving. This framework will allow us to measure the level of authenticity of the activity. The aspects considered are: event described by the problem; question asked by the problem; existence, realism and specificity of the data; and purpose of the problem solving activity. Based on the adjustment between the real life of students and the situations described in word problems, several categories were posed: authentic, standard-fitting, standard, container, dressed-up exercises, and non-sense problems. In order to characterize the problems that Spanish children usually solve in mathematics classrooms, every word problem included in mathematics textbooks (corresponding to 1st to 6th graders) from two Spanish textbook publishers was analyzed and included into one of the above-mentioned categories. Results showed that most of the problems were standard-fit and standard problems. Results also showed that authentic problems were scarce, and that in higher academic levels there were more non-sense problems and less authentic problems. Some educational implications, regarding the convenience to improve some aspects of the problems ('purpose', 'event', 'specificity of data') in problems dealing with certain mathematical topics, are discussed.

‘What is this?’ - Prospective teachers’ knowledge on definitions

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The role played by teachers of the early years is crucial in what concerns the introduction of basic but fundamental mathematical contents and the initiation of a process of mathematical learning, where every stage is highly dependent upon the previous. Therefore, the mathematical knowledge of these professionals deserves a careful attention since it has a great influence on what is done in class and on what pupils learn. In mathematical activity, definitions are essential since they constitute a basic component of mathematical knowledge. This implies that, mathematics teachers should have a deep understanding of the nature of definitions, their role and their characteristics. In this study we will explore the geometrical knowledge that (prospective) teachers have of elementary geometrical concepts (rectangle/square), especially concerning the role played by definitions. For this purpose we have used a questionnaire on definitions about geometrical concepts within two teacher training institutions.

Student Use of Anomalous Authentic Scientific Data in the Face of Competing Explanatory Frameworks

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The goal of our study is to gain insights into how students develop, modify and reject different explanatory frameworks when faced with a mix of supporting, irrelevant and contradictory evidence in relation to an authentic epidemiological controversy. When learning any subject either in a formal
or informal setting students often encounter data that is contradictory to their current set of theories and beliefs. Understanding how students identify and explain, or fail to identify and explain, evidence that contradicts their theories is an important step in refining our knowledge base regarding student reasoning in the face of evidential challenges. Our pedagogical aim is to develop an account of how students use anomalous data from disparate sources with the intent of improving the development of inquiry oriented science materials, particularly those dealing with scientific modeling. In this study we examine 7th grade and undergraduate populations’ abilities to identify and explain authentic epidemiological evidence that does not fit their theoretical model for the cause of the niacin deficiency disease pellagra.

Elementary Pre-Service Teachers’ Knowledge and Beliefs about Mathematics

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Before entering the profession, teachers must develop a considerable amount of knowledge in a relatively short time period. Teacher preparation program designers would benefit from understanding pre-service teachers’ (PSTs) entry-level knowledge and beliefs. This project’s aims are to: (1) Characterize the mathematical knowledge for teaching, ability to analyze teaching episodes, and beliefs about mathematics teaching and learning of elementary PSTs at the onset of teacher preparation; (2) Compare PSTs’ knowledge and beliefs to those of practicing teachers; (3) Investigate the relations between knowledge and beliefs. Findings reveal that to effectively prepare elementary teachers to teach mathematics, teacher preparation programs need not only to focus on mathematics content knowledge, but also on their beliefs and on the ability to reason about/solve instruction problems.

Elementary school children’s understanding of experimental designs: generative vs. preventive causes

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The development and promotion of scientific reasoning skills are of great interest for researchers, educators and science organizations. For elementary school children, the focus has hereby primarily been on the development of evidence evaluation skills, children’s understanding of the hypothesis-evidence relationship, and their epistemological stances. However, a crucial ability, the evaluation of experimental designs, has so far not received attention for this early age-group. In two studies, we provide a description of the development of this ability, its links to other scientific reasoning skills and general cognitive abilities, as well as determinants of task difficulty. In Study 1, 211 children from grades 2 to 4 answered three experimental design items. In addition, they were administered two items assessing skills in data interpretation and strategies of experimentation (i.e., the control of variables strategy). In Study 2, 182 third- and 184 fourth-graders evaluated one of two experimental designs: One presented a generative causal structure in the task’s cover story while the other offered a preventive one. Results of the two studies indicated that (1) there is development in children’s understanding from grade 2 to 4, that (2) children’s skills in design evaluation are related to other scientific reasoning skills and general cognitive abilities, and that (3) development is not uniform in elementary school, but rather (4) dependent on the causal structure presented in the cover story. We discuss these findings with respect to a potential developmental sequence and the need for ability-appropriate classroom materials when teaching children about experimental design.

Longitudinal multilevel study on effect of autonomy-support and structure on engagement and learning

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Regarding effects of autonomy-support and structure on engagement and learning, inconsistent results emerged from Self-Determination theory studies. Some authors stress the crucial role of autonomy-support while others highlight the role of structure. This could due to discrepancy in methodology used and limited use of multilevel analyses. Cognitive load theory also stresses the central role of structure for learning (Kirschner et al., 2006). This issue seems to be still controversial. If these frameworks seem opposite, some authors support structure and autonomy as orthogonal dimensions (Jang et al., 2010). However, the effects of their interaction have never been tested. The aim of this study is to determine the main effects and interaction of autonomy-support and structure on engagement and learning. 655 students were asked to complete questionnaires about engagement, perceived teaching practices and knowledge in mathematics, in 7th and 8th grade. Multi-level analyses were used to take the classroom level into account. Results displayed a main effect of teacher structure on 8th grade behavioral and cognitive engagement, controlling for 7th grade engagement. A main effect of autonomy-support was found on emotional engagement. No direct effect of teacher practices was found on learning. However, engagement was found to be a significant predictor of learning. No significant interaction of autonomy and structure were found. The results stress the interest to combine these practices in classroom context to enhance the various components of students’ engagement and then learning.

Profiles of College Students’ Motivation and Learning Strategy Use
The overall purpose of this study was to investigate whether distinct groups of students exist among college age students in terms of motivation and self-regulatory learning strategies. First, within a multiple goals perspective, we examined mastery and performance goals to find the patterns of students’ goal orientations, along with other motivational variables (e.g. self-efficacy, help-seeking behavior) and students’ use of learning strategies (e.g. elaboration, control, effort). Second, we also investigated whether types of goal pursuit patterns explain the differences in students’ academic achievement. Three distinctive profiles were emerged such as ‘High Mastery Goals’, ‘Low Mastery Goals’ and ‘Low Performance Goals’ in relation to motivational and goal constructs. The positive relationship between academic achievement and identified motivational profiles was also found.

**Perfectionism and motivation for learning mathematics in higher education**

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Present research sets out to complement and extend previous research on perfectionism in the context of learning mathematics in higher education exploring the different motivational profiles of students showing different levels of adaptive and maladaptive perfectionism. Constructs from two different motivational theories, achievement goals theory and self-efficacy theory, were used to indicate students’ motivation, and students’ approaches to learning were also examined. A sample of 362 undergraduate technical sciences students from University of Zagreb, Croatia participated in the study. All students were enrolled in introductory-level mathematics course. Students completed questionnaire on perfectionism measuring adaptive and maladaptive perfectionism, self-efficacy in mathematics, achievement goals in mathematics and approaches to learning. Results of cluster analysis revealed that three different types of perfectionism can be differentiated (non-perfectionists with low standards and low discrepancy, adaptive perfectionists with high standards and low discrepancy, maladaptive perfectionists with high standards and high discrepancy). Adaptive perfectionists are more likely to pursue mastery-approach than non-perfectionists and to pursue performance approach goals more likely than both maladaptive perfectionists and non-perfectionists. Maladaptive perfectionists are more likely to pursue mastery-avoidance and performance-avoidance goals than the other two groups, while non-perfectionists are the most prone to work avoidance goals. Adaptive perfectionists have the highest mathematics self-efficacy and use the most adaptive approaches to learning (high deep and strategic approach and low surface approach). These results support previous findings that setting high standards is beneficial to motivation and achievement, while it has detrimental effect only when accompanied by the perception of discrepancy between those standards and actual accomplishments.

**The emotional experience of passionate thinkers during problem solving**

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Need for cognition (NFC) refers to an individual’s tendency to engage in and enjoy effortful cognitive endeavors (Cacioppo & Petty, 1982). Passionate thinkers are assumed to experience more enjoyment during cognitive tasks and to work more persistently on them even if they are confused or frustrated. However, there is very little research on this topic and so far the results on the emotional experience of individuals low vs. high in NFC during cognitive tasks are mostly ambivalent. Particularly the role of epistemic emotions such as surprise, curiosity, confusion, anxiety, enjoyment, frustration, and boredom has so far been neglected. Thereby, current research especially attracts notice to the positive impact of confusion on deep learning (D’Mello, Lehman, Pekrun & Graesser, 2012). The aim of our study was to analyze the effect confusion has on problem solving and the role of NFC during this process. A sample of 113 undergraduate students participated in a computer-based problem solving task. Confusion was found to be detrimental for problem solving, but it might positively affect persistence. Individuals high in NFC did not experience more enjoyment during problem solving. However, they kept working on the problem while experiencing more intense frustration. In addition, they seem to be less easily confused. In conclusion, our results suggest that passionate thinkers experience less negative emotions, rather than more positive emotion during cognitive problem solving.

How to recognize successful moments in learning contexts: Children’s causal attributions

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The aim of this study was to find out how children explain factors that lead to their success in authentic classroom learning activities. Twenty primary school children were followed over eight weeks. Children participated to ‘Detective course’ in which they needed to capture moments of success in by using Ipods as ‘detective equipment’. The pictures and video clips were used for stimulated recall interviews in order to find out childrens views of causal attributions concerning their competence in moments of success. Interview responses were coded to categories of causal attributions (Weiner, 2005). In the interviews children used mostly the pattern of internal, unstable and controllable causes when reflecting their success. Content analysis where conducted to pictures and video clip data to define how children see success in learning situations. Results of this study will be discussed in a framework of motivational aspects of classroom context.

Structure as a predictor of motivation and engagement in elementary language classes

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Background. Self-determination theory (SDT) has demonstrated a clear link between teacher autonomy support, structure, and student engagement in classroom studies. Studies in second language classrooms have found similar patterns related to young learners’ feelings of intrinsic motivation towards the foreign language. Aims. This study aims to demonstrate the predictive value of teachers’ classroom structure in promoting students’ SDT needs and in-class engagement through the use of surveys, external rating and qualitative description of the learning environment. Sample. 511 fifth-grade elementary students in 17 classes across 7 schools in western Japan were observed in foreign language classes twice and voluntarily completed surveys. Methods. Structural equation modeling was used to demonstrate the predictive value of teacher structure on students’ need satisfaction and engagement. Class behavioral engagement was rated by 3 outside observers. Specific teacher behaviors were explored in highly rated classes. Results. Teacher structure was found to have predictive value for student competence and relatedness, as well as for emotional engagement. Teachers rated highest by students tended to have comparatively more class activities and set classroom routines, as well as using fewer and shorter open-ended activities. Conclusions. This study represents an initial investigation of key SDT constructs in the Japanese elementary foreign language classroom. Results suggest that classroom structure as a construct may help predict and mediate SDT need satisfaction and in-class engagement. Further investigation and scale refinement may be necessary to demonstrate a full integration with SDT needs.

Implementing Hands-On Experience in New Service Development Learning Processes

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New Service Development (NSD) discipline is expanding within many managerial activities. This discipline can facilitate strivings toward successful accomplishment of a sustainable entrepreneurship. Therefore, many academic institutes all over the world teach courses within this domain. This study aims to present a novel approach that educates engineering students to become an entrepreneur and to evaluate students’ attitudes to the learning environment. This approach, enhancing creativity and innovation, is based on contextual learning, embeds a practical project within the NSD program. The 47 students had to implement the academic know-how into an embedded project. The study utilizes a questionnaire, a quantitative tool to measure the students’ attitudes to the preferred and the actual learning environment. The learning environment was divided into five categories: student supportiveness, independent learning, integration between the practical activities and theory classes, guidance contribution and creativity. The effect of category was significant in influencing the preferred responses, the actual responses and the differences between them. The results show that the actual rank in about 60% of the questions was at least as the preferred rank. About one fourth of the questions revealed that the preferred rank was higher than the actual rank by one unit. The relatively small gap between actual and preferred learning environments indicates that the students were satisfied with the educational process. The combination of academic knowledge with practical know-how can facilitate the engineering student’s integration in future NSD projects.

Improving public understanding of science through the ‘guessing behind science news” teaching
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During our everyday lives, there are so many issues related to science. Is our food, water, and air healthy or not? Is our environment threatened by toxins or by some chemical elements? How will the most recent technological development affect human beings now and in the future? These scientific issues arise almost every day, and always have strong connections with individuals and society. Science news is the most important and convenient information available. With it, the public could achieve a certain level of scientific literacy due to its updated and accessible features. However, the complicated procedures behind the science news could play a very important role affecting the public’s understanding of the ‘real’ science issues. Based on this premise, this study aims to promote students’ understanding of science by guessing something behind the science news. With this idea, a teaching model including steps of reading, guessing, summarizing and clarifying was developed, and coined as, ‘guessing behind science news’ teaching. During the lesson, all participants were selected from students enrolled at the university-level within a general education program in Taiwan. Both qualitative and quantitative data was collected. Preliminary results have shown that the ‘guessing behind science news’ instruction could efficiently expanding students’ monitoring dimensions for science news. The results are also convincing that a citizen with scientific literacy and media literacy simultaneously, will benefit from more opportunities to join in discussions about scientific issues.

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In Japan, the number of the schools which introduce argumentation into classes is now increasing in higher education. Despite this trend, however, empirical studies about how to teach argument are scarce and its effect has not been sufficiently tested yet. The present study aims at (1) introducing the parallel-repeated learning design of argumentation and management and (2) examining the effect of the course. The 4-year practices from 2008 to 2011 for 80 students each year in the subject ‘presentation’ reveals that the course structure composed of the three elements is effective (Fig 1): (A) ‘Knowledge phase’ to acquire knowledge on the theme, (B) ‘Argumentation phase’ to acquire skills of argumentation and oral presentation, and (C) ‘Management phase’ to acquire management skills necessary for complete tasks. The program was designed for students to learn (B) and (C) in parallel in the domain of (A), which repeats twice in 15 classes in one semester. The three analyses were used to test the effect, comparing the scores of pretest, midtest and posttest. The first analysis is about the Basic Skills for being a member of society proposed by Ministry of Economy, Trade and Industry. The second analysis is about how they reflect themselves regarding the above Basic Skills. The third analysis is about how they think about presentation. The results show that the learning environment of this framework was effective for the students. By discussing their developmental process, the future prospects of inter-curricula learning will be further explored.

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In The Museum of Anything, an educational game for mathematics practice, math exercises are offered to the learner in an adaptive manner that is contingent upon the presumed difficulty of the respective math rules as specified in a widely adopted method for math teaching. The problem is that this adaptivity algorithm does not take into account the context of the game environment. We hypothesize that the difficulty of math exercises in educational games is not only determined by the inherent difficulty of the corresponding math rules, but also by contextual variables involved in play, i.e. the element interactivity that forms part of the game’s design. The principal aim of this study is to investigate how the educational game affects the experienced cognitive load and the difficulty of math rules. First, a comparison of perceived difficulty en cognitive load will be made between math exercises presented in pencil-and-paper format and math exercises offered in the game. Measurement of the in-game behavior will also be taken into account. Additionally, as the math rules in the game are offered in six different mini-game formats, the cognitive load induced by these formats will be investigated. Math rules with equal difficulty on paper may become more difficult when presented in different mini-game formats. Comparisons of experienced difficulty level and cognitive load across mini-game formats may thus yield insight into the features of gameplay that determine cognitive load. Finally, expert- and user-ratings of difficulty will give information about the current order of math rules.

Does an Optimal Model Exist for Integer Addition and Subtraction?

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Mathematical models have become a large presence in the K-12 classroom, but there are open questions about the importance, optimal type, and use of models in supporting students’ mathematical understandings. This work looks at two types of models for integer addition and subtraction: the chip model (an imposing model) and the elevator model (a non-imposing model). We consider how each of these models can be used to explain integers and integer operations. While we would like to determine which model is optimal for teaching integer addition and subtraction, more work is needed to understand how particular models are used to support mathematics learning; work that must move from the laboratory into the classroom. Only when we have a better understanding of how students and teachers use models, can we explore the question of the optimal model.

The added value of adaptivity for providing challenge in serious math games

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The Museum of Anything is part of the educational games series Monkey Tales and is designed for practice of mathematics. The content that is provided in this game comprises math rules extracted from the publishers’ handbook. All rules are ordered according to difficulty level, as rated by teachers. The game offers a drill-and-practice environment in which these rules are presented. In each mini-game, the learner can practice one specific rule, and competes with an opponent (a monkey). Currently, the game provides adaptive presentation of math rules, based on learners’ mastery of math rules. For example, if a learner wins a mini-game (i.e. masters a rule), the opponent’s time-to-respond (TTR) will be increased. If a learner loses a mini-game, an easier rule will be offered. This study focuses on extending this adaptivity mechanism, by not only taking into account learners’ mastery of rules and math skills, but also their gaming skills, their perceptions and in-game behavior. In this poster, we present the design of three experiments to improve the effectiveness of adaptivity rules for game-based learning. In experiment 1 and 2, the opponent’s accuracy and TTR will be increased or reduced, based on the learners’ mastery of math rules or on their math skills. These studies intend to investigate for which learners the adaptive condition works best, and whether learners’ beliefs, perceptions and goals mediate any effects of adaptivity. In the third experiment, learners will be offered control over the game environment (features of the opponent or the mini-game).

From text to mind map: Using pen movements to explore dynamic construction in upper primary school

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During the ages of 11 to 13, independently learning from informative texts becomes increasingly important. In this respect, developing and stimulating strategies that students can apply for organising and condensing textual information in a more memorable form becomes crucial. This study focusses on mind mapping as such a strategy, more particularly on the evolution of fifth and sixth graders dynamic mind map construction skills. In this paper, two studies are reported. In a first exploratory pilot-study the possibilities of using pen software, recording students’ pen movements and verbalised thought processes, were studied to explore dynamic mind map construction. In a second intervention study, the developmental pattern in mind map construction (product and process) was investigated and related to the specific mind map instruction method, i.e. working with author-provided versus student-generated mind maps. The pilot study indicates the great potential of using pen movements to capture and investigate the evolution in dynamic mind map construction.
The think aloud data, however, were not useful for data analysis. With regard to the intervention study, off-line analysis shows that the final mind map products of the experimental conditions improve significantly in contrast with those from the control condition. As to the mind map construction process itself (on-line analysis), preliminary analyses reveal that only few students explicitly engage in metacognitive processes (i.e. planning and revision) during mind map construction. This research can inform educational practice on how to develop and stimulate mind map construction skills from late primary school on.

**Effects of prior knowledge, perceptions and explained tool functionality on tool use and performance**

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The present contribution examines whether embedding tools and explaining the functionality of tools may provide a solution to the inadequate use of tools and whether this is related to learners’ prior knowledge, perceived (tool) functionality and perceived (tool) usability. Moreover, this paper investigates the effects of quantitative (time and frequency) and qualitative aspects of tool use on performance. One hundred and seventeen university students were randomly assigned to one of five conditions (embedded and non-embedded with explained tool functionality, embedded and non-embedded with non-explained tool functionality and one control condition) to study a hypertext. Results reveal that embedding tools had no significant impact on the use of tools, but explaining the tools functionality showed a negative impact on quantity of tool use (time). Prior knowledge had a positive effect on frequency of tool use and perceived usability had a positive relationship on time spent on tools. Perceived functionality showed no significant effects on tool use. Finally, time spent on tools had a positive relationship with performance while frequency of tool use showed a negative relationship. Unexpectedly, a positive correlation between quality of tool use and frequency of tool use was found. Surprisingly, there was no significant difference among conditions in relation to performance. Theoretical implications and specifications for future research are discussed.

**Positive Emotions in Multimedia Learning: An Eye Tracking-Study**

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The present study examines emotions in multimedia learning environments. Based on a study by Um et al. (2012) similar conditions in a 2x2 experimental design were introduced. Thereby the participants received externally induced positive or neutral emotions and learned a multimedia programme on Immunization which was also designed positively or neutrally. The positive design
contained anthropomorphisms. Data were collected in assessing emotional state, learning outcomes and fixations on the learning material with the help of an eye tracker. First results constitute that learners who received the externally induced positive emotions profited from the positive design by showing a higher learning performance. In addition, the eye tracking data reveal that the group with the positive design focussed pictures in the learning programme significantly longer and more often. In sum, the use of anthropomorphisms seems to support the learning process when learners are already in a positive emotional state.

**Does Spatial Ability Moderate the Seductive Details Effect? An ATI-Study Using Eye Tracking**

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The present study examines whether the seductive details effect is moderated by spatial ability, which is one of the most relevant learner characteristics in multimedia learning. It is assumed that the seductive details effect with an increase in cognitive load and a decrease in learning success is only present for learners with low spatial ability. In contrast, learners with high spatial ability should be able to compensate or even profit from seductive details. Using an Aptitude-Treatment-Interaction Design with spatial ability as aptitude variable and seductive details (with vs. without) as treatment variable, participants (N=50) were asked to learn about biology with a multimedia instruction that manipulated seductive details. First results show the detrimental effect of seductive details: Learners learning performance was significantly lower when learning with seductive details. In addition, the eye tracking data indicate that the learners who learned with seductive details showed a significantly lower sum of fixation time concerning the pictorial information of the relevant learning material. The additional moderating role of spatial ability will be discussed.

**(Non-)Biased Information Evaluation on the Web: The Role of Prior Attitudes and Epistemic Beliefs**

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Information-seeking on the Web requires evaluating the trustworthiness of information. However, this evaluation can be biased by information-seekers' prior attitudes and epistemic beliefs. This study examines the role of these variables on the evaluation of conflicting Web information. The focus lies on disentangling the effects of prior attitudes and epistemic beliefs as well as their interaction. The question is whether sophisticated, evaluativist epistemic beliefs can reduce information-seekers' preference for attitude-consistent information, leading to unbiased evaluation behaviour. By including process measures (eye-tracking, retrospective interviews) more insight into the cognitive processes involved in information evaluation can be gained. Sixty university students are presented
with twelve sources of differing quality containing both information in favour and against the controversial topic of homeopathy. It is expected that participants with evaluativist epistemic beliefs express non-biased evaluation behaviour, as evidenced by high trustworthiness ratings of high-trustworthy sources (irrespective of stance) and low trustworthiness rating of low-trustworthiness sources. In addition, they are expected to pay an equal amount of visual attention to pro and con information, and to write balanced essays. In contrast, students with multiplist beliefs are expected to express biased evaluation behaviour, as evidenced by high trustworthiness ratings of attitude-consistent sources, and low ratings of attitude-inconsistent sources, irrespective of actual trustworthiness. In addition, they are expected to pay more visual attention to attitude-consistent than attitude-inconsistent information, and to write one-sided essays. The results of this study may inform the development of concrete interventions how to reduce confirmation bias.

**Does the split attention effect works in test items as well?**

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The split attention effect has been demonstrated in several studies in the context of multimedia learning (Mayer, 2005). However, in the assessment of science achievement it is unclear whether principles gained from cognitive theories of multimedia learning work. In two studies we examined how presentation of information in test items influences the probability of answering items correctly. In the first study we experimentally manipulated the spatial contiguity of information relevant for solving the item. The results revealed that the probability of answering items correctly increased while experienced cognitive load decreased when the information of the stimulus was presented physically integrated with the corresponding item as compared with physically separated from it. In the second study we examined the effect of integration aids relating two different representations (i.e., text and picture). The results revealed that items containing integration aids (highlighting and referencing of information in text and picture) improved answering the item correctly. However, the effect depends on the informational relation between text and picture. Results will be discussed regarding their relevance for test designers.

**Approaching to an Adaptive Hypermedia Model for Learning in Higher Education**

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The present work describes a practical and theoretical framework to adapt a Learning Management System (LMS) to learners based in the Adaptive Educational Hypermedia. The prototype is primarily based on motivational variables such as self-efficacy judgments and students’ learning goals. The
adaptation process was made up by the set of computer rules, programing that some actions trigger
the necessary preconditions to activate others. The final result was a set of actions that define what
and how the contents and the feedback are delivered to the student. The present work has been
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25978.

How can education be existentially sensitive? A research project

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Abstract This poster presents our new on-going research project concerning existentially sensitive
education. The guiding research question in the project is: How can education be more significant?
This question is being answered through following sub-questions: (1) How do the curricula and
pedagogies address existential search? (2) What is the relevance of the education to the students?
(3) What are the existential sensitive good practices in education?

Structure, autonomy-support, control and feedback in Japanese English conversation classes

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Teacher student interaction is seen to have a significant impact on student engagement and by
extension learning. However little is known of teacher student interaction in Japanese EFL
conversation classes where lecturers and students often do not share the same language or culture.
This presentation will situate preliminary findings from a longitudinal qualitative study examining the
teaching practices and stated beliefs of eight native English speaking lecturers at one private
Japanese university into the established research into formative feedback, and autonomy-support
and structure. Initial findings from the study indicates a general lack of feedback in the classroom.
Furthermore, much of the observed interaction in the classroom while highly structured, is often
controlling in nature and lacks autonomy-support. This paper will argue that the autonomy-support
& structure model, more than the formative feedback model, provides a better explanation for
current teacher student interactions and a clearer path forward in improving current teaching
practice. Potential future directions will then be presented.

Promoting moral behavior of adolescents

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There have been described in the literature a number of studies in the domain of moral intervention for adolescents. To a large extent the interventions were aimed at increasing the level of moral reasoning of students at school. The current interventional study is based on the theory of ‘Planned Stage-by-Stage Mental Actions Formation’ introduced by Peter Galperin. The theory is the extension and continuation of a trend in developmental and learning psychology which was started by Lev Vygotsky. Galperin introduces the system of psychological conditions which enable knowledge and skills formation with the desired and prescribed outcomes. According to Galperin’s approach, mental action is a functional structure that is continually being formed throughout an individual’s lifetime. Using mental actions, people plan, regulate, and control their performance by means of socially established patterns, standards and evaluations. The propositions of Galperins’ theory were widely applied in the sphere of cognitive skills formation. However much less is known about its applicability to the field of moral behavior. Current project is aimed at applying Galperin’s approach to develop intervention focused on promoting of moral behavior of adolescents at school. The intervention would be conducted in several schools in one of the city-regions of Moscow. The project is supported by the City Educational Department and will include training sessions for adolescents as well as active teacher-school psychologist and academic psychologists cooperation. The intervention is scheduled to be conducted in January, March 2013.

Hypervideo design: enriching videos to support teaching and learning

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Using videos for educational purposes can facilitate comprehension and transfer of knowledge. However, the video in itself does not enable students to actively interact with the contents. To overcome these limitations, traditional videos can be enriched with additional information, to be transformed into hypervideos. We illustrate here some preliminary results on how hypervideos can be constructed using a tool called Scuolavisione, which enables teachers to create hypervideos by inserting interactive points along the video. In particular, we consider which kind of contents and additional material can be incorporated in it. Results enabled us to outline several possibilities of creating hypervideos and also led us to hypothesize that, depending on the type of knowledge to be taught, different ways of choosing the videos of departing, of making them interactive and of using hypervideos in class may be selected.

The Motives: Gender (A-)Typical Career Choices of Young Women and Men

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Career choices in the fields of science, technology, engineering, and mathematics (STEM) are favoured by men and often avoided by women; on the other hand, women tend to choose fields such as the social sciences. This not only leads to a shortage of employees with STEM degrees, but also reinforces the prejudice that certain (personality) characteristics are ‘typically female’ or ‘typically male’. Career orientation motives of young women and men can have important implications for gender (a-)typical career choices. However, there is little empirical research on the correlates of career orientation motives in young women in the field of STEM. This study seeks to address this gap by outlining the components of career orientation motives and showing relationships among them. Therefore, our results provide insight into the circumstances and conditions that are associated with academic and career choices. Keywords: career orientation, gender equality, STEM, motives, study field

See, relate, reflect! Intervention training in the classroom for improving reading comprehension

An increasing number of primary school children show alarmingly poor levels of reading comprehension. Children often do not truly understand a text, because they stick to the literal level of a text, and do not construct a visuo-spatial mental representation (i.e., situation model) of the described situation (Zwaan & Radvansky, 1998). This intervention study investigates if readers receiving explicit instruction in using situation model-focused strategies will show increased reading comprehension. The targeted strategies, which are crucial to make a situation model are visualization (Zwaan, 1999), inference making (Yuill & Oakhill, 1988), and comprehension monitoring (Rubman & Waters, 2000). In total 300 fourth graders will be recruited. The study employs a pre-post test control group design, measuring visualization, inference and monitoring abilities. Moreover, several control variables such as decoding skill and spatial ability are measured. The training intervention contains 8 lessons wherein each child will be trained in one of the three strategies. Training occurs in groups of 5-6 children and consists of direct instruction, modeling, guided practice, and individual practice. The control condition follows the regular reading curriculum. We expect that, compared to controls, training in visualization, inference making, or monitoring will improve post-test performance on respectively visualization, inference, and monitoring tests. Furthermore, we explore cross-over effects between trainings and tests. Results will be presented at the Earli conference.
Individualized reading instruction fosters reading fluency of three and four graders

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Regarding the heterogeneity of early readers, it seems obvious that promoting reading competencies should consider the initial learning status of each student. Theoretical models underline that there should be a differentiation between fostering reading fluency and reading comprehension, and many interventional approaches suggest the use of peer-supported evidence-based methods. Hence, the aim of our study was a) to provide teachers with material for an individualized reading instruction to promote reading fluency and reading comprehension and b) to analyze the effects of individualized reading instruction. These research questions were investigated with 42 classrooms (n=933 students) from grades three and four during one school year in a pre-posttest design. The experimental group (EG) was provided with two evidence-based methods: a) the repeated reading method that fosters reading fluency by repeatedly reading a passage out aloud and b) the reciprocal teaching method which fosters reading comprehension by using reading strategies in a dialogue between students. Individualization was realized by pairwise grouping of students to one of the reading methods and by choosing adequate text difficulties. The control group (CG) received regular reading instruction. Growth in reading was assessed before and after the implementation of the individualized reading instruction with standardized tests (SLS1-4: reading fluency; HAMLET3-4: reading comprehension). Analyses reveal significantly higher gains in reading fluency for the EG, whereas differences between both groups concerning reading comprehension turned out to be smaller. Taken together, the individualized reading approach was effectively implemented in normal school settings and led to better reading outcomes than regular reading instruction.

Self-efficacy beliefs in reading from a developmental perspective

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Spain  

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Olga Arias
The aim of this study was to analyze from a developmental perspective changes on students’ reading self-efficacy beliefs and its calibration using data obtained from cohort groups of students ranging from 8 years old (3rd Grade Primary Education) to 16 years old (4th Grade Secondary Education). The sample comprised 1005 students (506 male and 499 female) distributed across eight grades of eight schools of León city in the north of Spain. We took measures of reading self-efficacy previously to the reading tasks by a scale based on Bandura’s guidelines, previously validated, and also, for analyzing students’ calibration of their beliefs we collected reading performance measures through a standardized test of reading comprehension and a summarizing task. Data analysis currently underway, and will be reported at the conference.

Reading and writing patterns in students of Spanish compulsory education

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Previous studies have shown that both reading and writing are similar processes of constructive way, and it exists positive relationship between they. Two aims were established for this study: to identify the reading and writing patterns, which are used by students from 5th Primary Education to 2nd Secondary Education; and second, to analyses the relation between these patterns and the level of reading comprehension and quality of summary. The participants in this study were 509 students of Spanish compulsory education. We took measures of: i) reading and writing processes by means of triple task technique, ii) summary, and iii) reading comprehension with test, which included 10 multiple-choice questions. Preliminary results identify three reading and writing patterns: i) initial reading, ii) recursive reading, and iii) initial reading with recursive reading. Now, it is necessary to finish the identification of this reading and writing patterns in order to analyse their relations with level of reading comprehension and quality of summary. This research was possible with funds from Science and Innovation Ministry of Spain through research project (EDU2010-18219) that was awarded to Dra. Fidlago.

Repeated Reading Intervention in Kindergartners: Transfer and Retention Effects

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The direct, transfer and retention effects of a repeated reading intervention study of single CVC words in kindergartners with partial letter knowledge were examined. A total of 26 second year kindergartners participated in this study. Subjects were divided over two conditions, each receiving a different type of feedback. One group received feedback on the whole word and the other group on the segmented sounds of the word plus the whole word. All subjects participated in the intervention which lasted 10 sessions, each consisting 25 CVC words and 25 CVC pseudowords. For all items during all sessions, reading speed and accuracy were measured. Prior to and after the intervention a transfer task was administered, containing 50 different items. Two weeks after training retention of the trained items was tested. For the intervention there was an increase in reading speed and accuracy and no differences between the two conditions were found. For both groups strong transfer and retention effects were found, indicating that the knowledge is transferable to untrained words and is retained in memory. The results of this study indicate that a repeated reading intervention in kindergartners is an effective method to improve reading speed and reading accuracy on trained and untrained words.

Transfer Effects of Text-Based Discussions for Reading Comprehension: A Best-Evidence Synthesis

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This best-evidence synthesis investigates whether classroom discussion about texts have generative value for students by enabling them to demonstrate transfer of their comprehension abilities to new texts and novel tasks. We examine evidence of the effects of text-based discussion from quasi-experimental and experimental studies where researchers have assessed the effects of discussion on comprehension measures that are independent of the texts discussed. Results show sizeable effects from studies of Junior Great Books Shared Inquiry, Questioning the Author, and Collaborative Reasoning, especially on researcher-developed measures. Nonetheless, the evidentiary base on classroom discussion as it affects students’ reading comprehension abilities is moderate and restricted in terms of grade level studied. There is evidence that classroom discussions about text can enable students to acquire the habits of mind to transfer their comprehension capabilities to new texts and tasks. However, effects are variable and most studies are quasi-experimental, suggesting that the observed effects are due to or conditioned by factors associated with the schools, classes, or groups under investigation.

Examining pre-service history teachers’ subject-specific beliefs

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Despite the fact that pre-service history teachers’ subject-specific beliefs are a crucial factor in determining their teaching approach, there exists little research on these beliefs. This is especially important, as previous research based on case studies leads us to believe that these pre-service teachers hold predominantly traditional beliefs about history and its teaching, contrary to research findings emphasizing the integration of historical inquiry within the classroom and the use of technology to support inquiry activities. Therefore, this contribution presents a work in progress to examine pre-service history teachers’ subject-specific beliefs about knowledge and instruction in general, but also about historical inquiry and the use of technology to support inquiry activities, as well as their intention to adopt these practices. Because of the little research available, a new questionnaire was constructed through a review of the literature, in order to measure these constructs. This questionnaire will be administered to a broad sample of pre-service history teachers from various three-year bachelor programs of teacher education in Flanders, so that a model of the relations among subject-specific beliefs and the intention to adopt historical inquiry and the use of technology to support inquiry activities can be constructed. Based on previous research, it is expected that pre-service history teachers hold predominantly traditional beliefs about knowledge and teaching in history, and consequently will report a low to moderate intention to implement historical inquiry and to use technology to support it. During the poster presentation, preliminary results will be presented together with the newly constructed questionnaire.

Are implicit math-language gender stereotypes predictive for teachers’ school career recommendations

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Girls tend to have more negative math related attitudes, self-concepts and anxieties than boys. Accordingly, fewer women enter math-intensive fields for their career. Teachers are seen as one important environmental factor influencing math attitudes of students. Previous work has shown that teachers’ gender stereotypes influence their expectations and beliefs towards boys and girls which in turn impacts students’ achievement and interests. However, it is far from clear how teachers’ stereotypes influence students’ attitudes and achievement. The present study scrutinizes whether teachers’ gender stereotypes are predictive for recommending different school types (more language or math-science oriented schools) for girls and boys. Teachers’ recommendations are seen as one out of many crucial behaviors that may promote a transfer of gender stereotypes. Our
experimental study investigates how explicit and implicit math-language gender stereotypes (measured with the Sorting Paired Features Task by Bar-Anan, Nosek & Vianello, 2009) as well as essentialist beliefs relate to teachers’ behavior. Student teachers were presented with short descriptions of fourth grade students’ school achievement in math and German who were randomly assigned with either a male or female name. They were then asked to rate whether they believe the student to be more qualified for a language or math-science oriented secondary school. We hypothesize that having a higher level of implicit stereotypes and possibly essentialist beliefs leads participants to rather recommend a math-science oriented school for boys than for girls. First results will be presented and discussed.

Science teachers’ teaching efficacy beliefs and their conceptions of learning and assessment

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This study explored the relationships between high school teachers’ science teaching efficacy beliefs on the one hand, and their conceptions of learning science and science assessment on the other. To this end, 90 high school science teachers were invited to respond to three questionnaires assessing their science teaching efficacy beliefs (including outcome expectancy and self-efficacy), their conceptions of learning science, and their conceptions of science assessment. This study found that these science teachers tended to have a stronger belief that they have enough ability to teach science than that students’ learning can be influenced by their effective teaching. The path analysis results achieved with the structural equation modeling technique further revealed relations between the science teachers’ conceptions of learning and assessment and their teaching efficacy beliefs. The overall findings suggest that teachers who stress the lower-level features of learning and assessment may more easily believe that students’ learning can be influenced by their teaching. Furthermore, high self-efficacy of teaching science may come from teachers’ sophisticated conceptions of learning science.

Teaching practices observed in prospective teacher’ field practice

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We present some findings from the Teachers as Student project (TasS), an on-going research project looking at how Norwegian prospective teachers can learn teaching to promote pupils’ learning from field practice. The project uses a time-lagged design experiment that involves: (1) a study of preparation for field practice as it naturally occurs (within a control group); followed by (2) an intervention designed on the basis of the results from the first study, inspired by lesson study approaches to developing teaching. This three-year research project involves mathematics, science, English as a foreign language, and physical education (PE). In this poster we present the project, analyze the control group and ask which teaching practices (and tasks of teaching) are emphasized during field practice. We limit our discussion to mathematics and PE student teachers. By analyzing
videotaped lessons from student teaching we are able to compare teaching practices both within and between the two subjects.

**Adressing Heterogeneity Through Teamwork: Effects on Teacher Confidence and Internal Differentiation**

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In increasingly heterogeneous classroom situations, the ability to meet the individual needs of each student is highly relevant for both teachers (e.g., with respect to their self-efficacy and well-being) and students (e.g., with respect to optimized learning conditions). This study sought to investigate teacher and student perceptions of how well teachers deal with heterogeneity. In a model project at a German high school, teachers were given the support of a classroom assistant for individualized teaching over a six-week intervention period. Teachers’ self-efficacy with regard to student heterogeneity and their students’ perceptions of internal differentiation (i.e., the teacher’s ability to provide individualized instruction) in German and math classes were examined in this study in which altogether N = 48 teachers and N = 96 students (grades 5-8) participated. The results of the pretest showed that the staff of the school rated their confidence in situations of achievement heterogeneity the lowest among all the aspects of their daily teaching demands that were rated. Pre- and post-analyses revealed that teachers felt significantly more confident and self-efficient in personalized teaching in their classes after the six-week intervention phase of cooperation with a classroom assistant. Similarly, students reported an increase in teaching practices reflecting internal differentiation in German and math classes. The study’s results demonstrate the pressing need to support teachers in the face of increasing heterogeneity among students. Furthermore, cooperative teaching involving classroom assistants may be a promising way to foster both the well-being of teachers and the individual learning and development of students.

**Pre-service teachers’ self-perceived educational competencies at German universities of technology**

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Germany

Angela Ittel  
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Germany

In this longitudinal study we examined the development of pre-service teachers’ self-perceived educational competencies during their teacher education at five German universities of technology. The aims of this study were twofold: to describe patterns of competency self-assessments and to identify predictors (e.g., motivation, personality traits) that have an impact on the patterns of the self-assessments. This approach was chosen to identify specific characteristics of pre-service teachers
at the given universities with special focus on students aspiring to be teachers in STEM fields. Students participated for three semesters (NT3 = 161, three measurement points, starting February 2011). Using fixed effects regression models, we determined the effects of the development of relevant predictors (e.g. motivation, personality traits) on the change of the self-assessment of pre-service teachers’ competencies. Results show that several predictors (e.g. stability, intrinsic motivation) are positively linked to the self-perceived competencies. Accordingly, a strengthening of these predictors might lead to an increase in the self-assessment of the students. The relevance of the results in terms of supportive structures for pre-service teachers at universities of technology will be discussed.

**Dimensions of (additional) educational support needs within the continuum of pedagogic approaches**

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Today’s mainstream education reinforces teachers being pro-actively aware and responsive to the diverse educational needs of students in their classrooms. Several authors have stated that educational needs should be defined within a continuum and not as a categorical distinction. A framework of graded learning support is needed to describe common teaching strategies in more intensive, frequent or explicit ways to meet special educational needs. This framework could be found in combining the continuum of pedagogic approaches. Recently, research reported empirical distinction of four dimensions of students’ additional educational support needs, as addressed by teachers in mainstream primary education. Therefore, this round table session addresses the question how this new knowledge about these empirically substantiated dimensions of (additional) educational needs can be incorporated within the continuum of pedagogic approaches. How do these dimensions of educational needs fit into the continuum of pedagogic approaches? How does this framework reflect teachers’ practice? How can this continuum be helpful in supporting teachers to assess their pedagogy and enhance teachers’ capacity to cater for a wide range of educational needs?

**Can the use of ‘emergent’ language serve as an indicator of conceptual change?**

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Ronald Miller  
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Dana Denick  
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This paper investigates the impact of instruction on emergent schemas on repairing robust engineering student misconceptions about heat. Chi and her colleagues propose that heat conduction occurs via an emergent non-sequential process and is subject to significant student misconceptions caused by an ontological mismatch between a perceived (but incorrect) direct, sequential transfer process and the correct but not observable emergent, non-sequential process. A mixed methods experimental design was used to study the effect of ‘emergent process’ training modules on development of an emergent schema in advanced engineering students. Experimental and control groups (80 students each) completed on-line modules about diffusion, heat transfer, and microfluidics. Only the experimental group received explicit instruction in the dynamics of emergent processes. All students also answered multiple-choice questions targeting specific concepts and were prompted to provide open-ended explanations of the concepts. We address two research questions. (1) Do students who received emergent schema training use more ‘emergent’ language when describing scientific phenomena than students who have not received this training? We used a priori coding to determine the extent of ‘emergent’ language use. (2) Is there a relationship between use of ‘emergent’ language in describing scientific phenomena and choosing scientifically accurate responses on conceptual multiple-choice questions? Chi-square was used to answer this question. Preliminary results suggest that students in the experimental group use more emergent language than students in the control group. And students who use emergent language are associated with a higher frequency of scientifically accurate responses to conceptual questions.

Building citizenship when teaching recent history in primary school: three transitional period cases

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ABSTRACT We will study transitions process from authoritarian to democratic regimes in Chile, Uruguay and Argentina as seen in citizenship education and recent history in primary school.
curriculum. We will focus in how decisions were made in this process, what contents and instructional strategies are chosen and how they relate to political and world processes regarding human rights and education. The study was done by analyzing curriculums and interviewing professionals who wrote the official curriculums, to see how they interacted with clue members of society to have the final outcome.

Mathematics Teacher Anxiety: Creating and sharing personal visual narratives with students

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The fear of learning and doing mathematics anxiety-is as old as the field of mathematics education itself, seen as a necessary evil stopping students from understanding and enjoying mathematics. Recent research shows mathematics anxiety is not exclusive to students; mathematics teachers struggle with it too. But teachers try to hide their anxieties in the classroom, often to disastrous results. Teachers can transfer their mathematics anxieties to their students, unwittingly creating a vicious cycle of fear. This study addresses this cycle by allowing mathematics teachers to reflect upon and understand their mathematics anxieties through photo-based narratives sharing these narratives to their students. The Photo-elicitation/Photovoice Interview method used here reveals teachers’ hidden stories of mathematics anxiety by accessing visual memories and reflective spaces in ways traditional research methods cannot. This method helps teachers create narratives anchored around specific photographs, bringing forth the memories and emotions the photograph elicits. These narratives reveal specific stories teachers constantly reference within their teaching, but rarely share. Teachers hide their mathematics anxieties in these stories. By providing a tool for teachers to explore these hidden stories and the role of mathematics anxiety in their teaching, this study attempts to stop teachers from transferring their mathematics anxieties onto their students. Furthermore, this study pilots a lesson teachers will use to share their mathematics anxieties with their students to establish a classroom culture where mathematics anxiety is normal and harmless, and students see themselves as real, struggling mathematicians.

The Effect of Achievement Goals on Attributional Retraining Among College Students

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According to Weiner’s attribution theory, causal attributions for failure which are stable and uncontrollable are detrimental to one’s motivation. In response, attributional retraining (AR) is a motivational intervention designed to restructure students’ causal explanations of poor performance by encouraging controllable and unstable explanations, thus improving motivation, increasing effort and, enhancing performance. While this technique has produced several results concerning academic motivation and performance, the moderating factors of its effectiveness need to be clearly identified. Employing a pre-post study design spanning an academic year, we examined the impact of mastery vs. performance goals on the effectiveness of AR on college students. Data collection will be completed April, 2013. After the first year of the project, preliminary data include 125 second-year college students who volunteered to participate in a two-phases study. All students completed a battery of questionnaires at the beginning (Time 1) and near the end of the academic year (Time 2). The instrument included items concerning students’ academic performance, the Achievement Goals Questionnaire and the Academic Attributional Style Questionnaire. 3Χ2 ANCOVAs were performed in order to examine the group effect on causal attributions for academic failure, including the achievement goals orientations as covariates. Preliminary results support the moderating role of
mastery and performance approach. Findings are discussed in terms of conceptual contributions to both the AR and achievement goals literatures, and practical implications are outlined.

**VIA-Youth strength questionnaire - A tool for measuring character strengths in IEP processes?**

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Our project is to translate and validate the widely used measure of character strengths, VIA-Youth (Park & Peterson, 2006), in Finland. VIA-Youth is a questionnaire that measures 24 character strengths organized under six broad virtues, wisdom, courage, humanity, justice, temperance and transcendence in youth, aged 11-17. Our first goal is to create a tool for identifying the strengths of students with special educational needs. Especially, in planning the Individualized Education Program (IEP) the student’s strengths are mentioned as ‘a starting point’ but, in Finland, no means have been developed to reliably measure the strengths. Measuring and documenting strengths in the IEP is the first step. Implementing strength-based learning in the curriculum and utilizing the individually identified strengths in daily (special) education is the ultimate goal of the current study. We have agreed on translation and validation of a brief VIA-Youth version of 100 items in Finnish. In Round Table discussion, we are mainly interested in the implementing of the character strengths. How can we put the strengths in practice? Knowing the students’ strengths may have positive outcomes in its own right but the aim is to develop true strength-based education. All students benefit from this approach but particularly those whose strengths may not easily show. Positive psychology interventions have proven to be successful (Seligman, Ernst, Gilham, Reivich, & Linkins, 2009) but not much has been reported on strength-based educational applications among special education students.

**Students’ time spent on learning, study strategies and learning outcomes**

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This study examines the relationships between students’ perceptions of heavy workload, time spent on learning, study strategies, and learning outcomes. Student’s study strategies were measured with a short version of Vermunt’s Inventory of Learning Styles. Some items were adjusted in order to be more appropriate for use in a university of applied sciences. Anticipated results are that these relationships differ across disciplines, but are also influenced by students’ perceptions. From a policy and practical point of view this study provides an alternative for satisfaction-oriented evaluations. Theoretically, the study may be relevant with regard to the assumption that contact time is important for learning and should be raised. The authors expected that the evidence for this
assumption depends on student characteristics and factors related to learning such as perceived workload. The results of the study will be presented in the round table.

**Efficacy of a Low-Cost EEG Toolkit to Evaluate Engagement and Learning with Science Simulations**

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Part of an ongoing study, this research explores the potential for inexpensive electroencephalography (EEG) technology (i.e., Emotiv headset) to address questions associated with engagement and learning associated with science and scientific simulations. Specifically, this study evaluates existing algorithms used to create engagement indices (see Freeman, Mikulka, Prinzel, & Scerbo, 1999; Pope, Bogard, & Bartolome, 1995). Further, this research reports on the benefits and challenges to using Emotiv and EEG to address questions associated with engagement and learning with scientific simulations. To eval, participants were exposed to several different experiences. A total of eight participants began with a baseline activity and then proceeded through three heightened phases: engagement, learning, and testing phases. Electronic impulses from each phase were recorded and logged as a means to characterize engagement. The value of engagement indices and obstacles to using Emotiv for EEG data collection will be discussed.

**Constructing responsible teacher – teacher accounts of pupils diagnosed with ADHD**

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Finland

Compulsory school teachers possess great responsibility in creating learning environment that supports pupil’s both educational and psycho-social development in order to construct a foundation for sustainable learning. Thus pupil’s school well-being is embodied in responsible teaching. In order to contribute to construction of responsible teaching this study analyses what kind of image of teacher institute is constructed through the teacher and school accounts of thirteen ADHD diagnosed adolescent. Data is collected through thematic interviews and analysis is based on the principles of qualitative narrative and discourse analysis. Preliminary findings bring into question the importance of pupil’s own perception of the interaction with teacher when defining the policies of responsible teaching and evaluating the outcomes of its realisation.

**Human rights education in school: an intervention study**

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The aim of this research project is to examine the effects of human rights education (HRE) in secondary school. According to the three dimensions of human rights education (learning about, through and for human rights), HRE should promote knowledge, positive attitudes and willingness to take action concerning human rights (e.g. tsch, 2012). In a quasi-experimental intervention study a learning unit on selected human rights topics, based upon the Universal declaration of human rights (UDHR; United Nations, 1948), will be implemented in secondary school classes. We will investigate the effects of different HRE approaches on cognitive and motivational learning outcomes; in addition, we will examine the potential of HRE to decrease prejudices against social minority groups. Taking HRE into account as a method to reflect on values and moral principles, we also analyse whether HRE promotes moral development in general. Following the findings in the field of moral development and moral education, which highlight the relevance of emotions for moral judgment and moral action, two teaching methods will be compared (Krause & Stark, 2011): One will be more cognitively oriented (with a focus on moral argumentation, e.g. pros and cons debate), and the other one will be more affectively oriented (with a focus on empathy, e.g. role plays). The study will be conducted in at least six secondary school classes (9th and 10th grade; N = 150). The results will be compared to control groups, which will not receive any specific human rights education.

Perspectives on Digital Reading in the Programme for International Student Assessment (PISA)

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The Organisation for Economic Cooperation and Development Programme for International Student Assessment (OECD PISA) is a triennial standardised assessment administered to 15-year-olds. PISA is the most comprehensive and rigorous international assessment of student knowledge and skills, with the countries and economies participating representing nearly 90% of the world’s economies. The special focus on reading in 2009 provided the occasion for a revisiting of the framework established in 2000 to see where new definition was needed. A key component of the revisiting of reading in 2009 was the introduction of a digital reading assessment as an international option: 19 of the 67 participating countries and economies took part. PISA 2009 has thus provided educational systems, school and teachers around the world with baseline data on this new area of reading. This symposium will look at the results of the PISA 2009 digital reading assessment from a variety of perspectives, with both national and international lenses. The aim of the symposium is to promote deeper understanding of the ways that young people read and respond to digital texts, with a view to advancing educators’ capacity to support students’ engagement and proficiency as readers. The symposium comprises four presentations which: i) explore the ways that boys and girls differentially negotiate digital texts; ii) closely analyse Spanish student responses to digital reading items; iii)
examine the factors that contribute to the difficulty of digital reading items; and iv) examine the relationship between reader profiles and digital reading proficiency in Hungary.

**Do Boys and Girls Read Differently On Line? Evidence from the PISA 2009 Digital Reading Assessment**

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Tom Lumley  
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Australia

Dara Ramalingam  
Australian Council for Educational Research  
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According to the results of PISA 2009, while girls are more proficient readers than boys in both the print and digital media, it appears that the gap in performance is narrower in the digital medium. It has been suggested that the narrowing of the gender reading gap might be attributed to relatively strong navigational skill on the part of boys. This presentation will explore the evidence for this suggestion, and will also look at other possible reasons for boys’ relative success in the PISA digital reading assessment, including the types of texts represented in the assessment and the proportions of different item formats.

**Behind The Scores. What Do Students Really Achieve in PISA Digital Reading?**

Lis Cercadillo  
INEE  
Spain

Alba Reboredo  
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Spain

This paper focuses on a qualitative analysis of students’ open-constructed responses to digital reading items from the PISA 2009 digital reading assessment. The PISA coding schemes give full or partial credit depending on the students’ performance level (OECD, 2011). In fact, this code allocation offers only quantitative information about what the student has done. A lot of nuances in students’ thinking are missed on the way. The richness of students’ responses is not visible enough because part of the real knowledge and understanding is hidden behind the codes. The PISA 2009 database for Spain will be used with the students’ responses to the released items from the field trial and from the main study as well as the responses extracted from both student and school questionnaires. Students responses will be investigated taking into account the main PISA framework variables, text and aspect, but also navigation. A series of parametric tests such as correlations and analyses of variance will be done to compare the different types of categorized responses (by levels of thinking, gender and navigation paths) on digital reading.

**Predicting Difficulty in PISA Digital Reading Items: The Role of Navigation**

Tom Lumley  
Australian Council for Educational Research
With the implementation of a Digital Reading Assessment (DRA) in PISA for the first time in the 2009 cycle came the opportunity to investigate commonalties and differences between the characteristics of items in the digital and the print medium. The PISA reading literacy framework describes features of reading that drive difficulty, but neither these nor the skill levels provided in the PISA reporting scale are explicitly tied to individual test items. Previous work (Lumley et al., 2012) has investigated features of print reading items that contribute to the prediction of item difficulty. The present study extends this work to the digital medium. Digital reading is conceptualised in the PISA 2009 reading framework as involving both text processing (as in the print medium) and navigation (specific to items in the digital medium). This study investigates the way in which ratings of items according to both text processing and navigation variables combine to predict difficulty. The study supports findings from the PISA 2009 Results (OECD, 2011) of the importance of navigation as well text processing in digital reading, and emphasises the need to understand how the two dimensions interact in this medium.

Reader Profiles and Digital Reading Performance of Fifteen-year-Old Hungarians

Laszlo Ostorics
Educational Authority, Hungary
Hungary

Ildiko Balazsi
University of Szeged
Hungary

OECD’s PISA2009 introduced two features until then unseen in large-scale international reading assessments: measuring 15-year-olds’ digital reading proficiency and constructing reader profiles based on frequency of reading diverse material and depth of learning strategy knowledge. This paper examines the relationship between the established reader profiles and digital reading performance in the case of Hungary’s PISA2009 results. The Hungarian school system makes extensive use of student tracking. 15-year-olds are divided among four school programs based on their results and perceived abilities: grammar schools, secondary vocational schools, vocational schools, and for a small proportion of students, primary schools. Data show that due to the unusually strong relationship between students’ SES and performance this also means latent social segregation. A series of linear regressions will be conducted to evaluate the relationship between reader profiles, digital reading proficiency and various background variables. It is expected that results will show that certain reader profiles remain associated with higher digital reading proficiency after the influence of family background has been accounted for. The aim of this paper is to look into how the different groups of students with different reader profiles are distributed across school programs, and what the relationship is between reader profile, family background and digital reading performance, in order to identify points of possible intervention, where educational programs for better learning strategies or reading practices might have some success.

German Longitudinal Data Resources for the Social Sciences
For psychology and education as empirical sciences data are of particular importance. Despite this, the collaborative use of large-scale data bases in psychology and education is still limited, compared to other sciences. The session starts with an introductory presentation focusing on the benefits of secondary analysis within social sciences and the challenges of long-term data archiving and user-friendly data access from the perspective of the German Research Foundation. After this, four German longitudinal panel studies will present their design and data: SOEP (The German Socio-Economic Panel), SHARE (Survey of Health, Ageing and Retirement in Europe), PAIRFAM (The German Family Panel), and NEPS (The German National Educational Panel Study) are the four major large-scale longitudinal studies in German social sciences that provide a unique data infrastructure on topics like inequality, aging, living arrangements, and education. These ambitious projects are forming a new basis for innovative, cross-national, and interdisciplinary research as they all make their comprehensive data available to the scientific community worldwide. Within the presentations, these projects will especially demonstrate their potential for research in various fields of psychology and educational research as well as new opportunities for international collaboration.

**The German Socio-Economic Panel as a Rich Data Source for Educational Research**

David Richter  
German Institute for Economic Research  
Germany

Jurgen Schupp  
Deutsches Institut fur Wirtschaftsforschung e.V.  
Germany

The SOEP is a wide-ranging representative longitudinal study of private households in Germany. Every year, on behalf of the SOEP, nearly 11,000 households and more than 20,000 individuals are interviewed by the fieldwork organization TNS Infratest Sozialforschung. The SOEP data provide information on all household members, including Germans living in the former East and West Germany, foreign citizens, and recent immigrants to Germany. The panel was started in 1984. The SOEP sampling framework allows for longitudinal analysis of the entire life course within the household context. The SOEP has contained concepts from psychology (such as locus of control) since the 1990s. Further concepts such as personality, reciprocity, subjectively rated justice, tendency to forgive, affect and mood, as well as cognitive competencies have been added since then. Correspondingly, the number of SOEP-based publications in high-impact psychological journals is increasing steadily, partly due to the fact that the SOEP data are freely available for scientific research purposes. In 2003 the SOEP introduced new questionnaires to gather data on children’s development, the mother and child questionnaires. These questionnaires include questions about the child’s personality, socio-emotional development, health, as well as the child’s day care or schooling settings. The presentation will give an overview of the SOEP and the psychological concepts
measured. We will highlight potentials for educational research with the SOEP mother and child questionnaire and with the measures of cognitive competences in adolescents.

**The Survey of Health Aging and Retirement in Europe – A European Research Infrastructure on Aging**

Frederic Malter  
Max-Planck-Institute  
Germany

Turning the challenges of population ageing into chances is a top priority for Europe and many countries around the world. The Survey of Health, Ageing and Retirement in Europe (SHARE) helps to understand individual and societal ageing. It is an infrastructure that collects micro data on health, socio-economic status and social and family networks of more than 40,000 individuals aged 50 or over. The third wave of data collection in 2008/2009 (SHARELIFE) focused on the life histories of the participants. A wealth of important indicators of the respondents’ childhood and mid-life were gathered. This provides researchers in psychology with the opportunity to study late-life outcomes with indicators of the respondents’ childhood and mid-life. The fourth wave was finalized in 18 countries in 2011, with Estonia, Hungary, Portugal and Slovenia as new additions. That wave brought innovations to SHARE with high potential for researchers: an extended module on social networks was added to the instrument, allowing a detailed assessment of respondents’ social embeddings and satisfaction with social connections and its ties to psychological well-being. This new module will enable us to explore critically under-researched aspects of older people’s life, e.g. relationships between retirement and social connectedness. Finally, various measures of the respondents’ and their parents’ education were measured in all waves, making SHARE an excellent dataset to investigate relationships between educational measures and socio-economic outcomes, health indicators or social and emotional well-being.

**pairfam - The German Family Panel**

Josef Brüderl  
Institute of Sociology  
Germany

The German Family Panel is a multidisciplinary, long-term research program that is yielding rich data for the longitudinal study of partnership and family dynamics in Germany. The study was launched in 2008 with a nationwide baseline sample of more than 12,000 randomly selected anchor respondents in the three cohorts born between 1991-93, 1981-83, and 1971-73. The multi-actor approach involves separate interviews with these anchor respondents, their partners, parents, and children at the age of 8 to 15 years. The survey is scheduled to run for a total of 14 waves with annually conducted interviews. Data are made available as early as possible to the scientific community. The scientific use file with data from the first four waves will be published in May 2013. The study has a strong focus on issues of partnership and family including several instruments on parenting and child development as well as on parent-child relationships and child caretaking. Related life domains such as education, work, and leisure activities are also covered by the survey program. The complex design allows researchers to analyze private living arrangements as they develop over time and in explicit consideration of the mutual interdependencies of family members. The presentation will (a) give an overview of the contents of the German Family Panel, and (b) demonstrate some of its potentials for educational research.

**The German National Educational Panel Study (NEPS)**

Thomas Baumer
The German National Educational Panel Study (NEPS) provides access to a huge data base on educational processes and decisions, learning opportunities, competence development and returns to education. In addition, the special situation of migrant groups in Germany is followed. The samples cover the whole lifespan from birth to retirement and beyond. To make information available as quick as possible, a multi cohort sequence design is utilized. Six starting cohorts are followed: (1) Infants, (2) Kindergarten, (3) 5th Grade, (4) 9th Grade, (5) University, and (6) Adults. Infants and adults are sampled individually whereas the other cohorts are institution-based samples. Data of the starting cohorts 2 to 4 and 6 are already available. Overall, the sample size approaches 60,000 target persons as well as 40,000 context persons (parents, educators, teachers and principals), making the NEPS one of the greatest scientific endeavors in social sciences. In this presentation, we will give an overview of the conceptual and theoretical bases of the provided data and the constructs and variables that are implemented in the assessments so far. Given the conference theme ‘responsible teaching and sustainable learning’, we will focus on the educational processes in learning environments, which comprise all learning opportunities in formal, non-formal, informal as well as familial educational contexts.

Theoretical and empirical research on Educational Evaluation, Accountability and School Improvement

Melanie Ehren
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Katharina Maag Merki
University of Zurich
Switzerland

Almost all countries in Europe arrange for external evaluation and accountability of their schools and/or teachers in order to improve the quality of education. The quest for quality has become even more focussed in the recent decade when economic globalisation has increased the significance of quality education and when international assessments of student performance provide measures for comparative appreciation of education results. In many countries, schools and teachers are held accountable for the quality and output of their performance and information on their performance is disclosed to policymakers and the wider public. Educational evaluation and accountability are expected to have a substantial impact on educational quality and school improvement. Evidence shows that such responses can be positive when improvements are made and teachers and principals work harder and/or more effectively. Available research however also points to negative responses when schools and teachers implement quick fix improvements and use strategic behaviour to manipulate the outcomes of external evaluations or narrowly focus on quantifiable and easy to measure elements in the external evaluation framework. Although, theoretical and empirical research on processes and effects of educational evaluation, accountability and school improvement has been significantly enhanced in the last years, little is known on the relationship and
interdependency between these three dimensions. Furthermore, from a theoretical and empirical perspective, the in-depth investigation of the respective processes and effects has to be taken into consideration more systematically. Therefore, it is the aim of this symposium to discuss several key issues and challenges on the theoretical and empirical analysis of the relationship of educational evaluation, accountability and school improvement.

Theoretical perspectives on the relationship between evaluation, accountability and improvement

Katharina Maag Merki
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Switzerland

Available research in the area of educational evaluation, accountability and school improvement draws from different theories like rational choice theory, theories of organisational learning or theories of professionalization. Hence, the range of the respective theories is quite large. Furthermore, international comparative analyses (Townsend, 2007) suggest that the theoretical focus is both influenced by contextual factors (e.g. the educational system or the ideological foundation of evaluation, accountability and school improvement) as well as by educational and scientific traditions. Therefore, it is the aim of this presentation to clarify and systematize the respective concepts, their interrelationship and the underlying assumptions. Firstly, this paper provides an overview on relevant theories and research questions related to educational evaluation, accountability and school improvement. Secondly, based on a longitudinal study to analyse the impact of the newly implemented state-based exit exams in Germany on teaching, learning and grading, the interrelationship between the emphasized concepts as well as the theoretical framework to understand processes and effects will be presented. Finally, the discussion will focus on new perspectives on the theoretical and empirical analyses of the interdependences of educational evaluation, accountability and school improvement. References Townsend, T. (Hrsg.). (2007). International Handbook on School Effectiveness and Improvement. Band 1 und 2. Dordrecht: Springer.

Policy perspectives on impact of school inspections; using a program theory approach to reconstruct

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Across the world, accountability systems have been introduced in education to monitor the performance of teachers and schools and to provide them with data to improve. In Europe, Inspectorates of Education are the main tool for (external) quality assurance of schools. Inspectorates of Education operate with the goal of monitoring and improving high quality education for all students. Surprisingly, there is little research knowledge about how school inspections drive the
improvement of schools and which types of approaches are most effective and cause the least unintended consequences. The study presented in this paper uses interviews with inspection officials and a document analysis to reconstruct the ‘program theories’ (i.e. the assumptions on causal mechanisms, linking school inspections to their intended outcomes of improved teaching and learning) of Inspectorates of Education in six European countries. The results present the commonalities and differences of these six national inspection models with respect to standards and thresholds used, to types of feedback and reporting, and to the sanctions, rewards and interventions applied to motivate schools to improve. Next, the intermediate processes through which these inspection models are expected to promote good education (e.g. through actions of stakeholders) are explained. In the concluding section, these assumptions are critically discussed in the light of research knowledge.

**Studying impact of school inspections across Europe**

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Melanie Ehren  
Institute of Education  
Netherlands

Inspection is used by most European education systems as a major instrument for controlling and promoting the quality of schools. Surprisingly, there is little research knowledge about how inspections actually drive the improvement of schools. This paper reports the results of a comparative study on the mechanisms of impact of school inspections in six European countries: the Netherlands, England, Sweden, Ireland, Austria (Styria) and the Czech Republic. The study uses mixed methods where first a qualitative program theory approach was used to reconstruct the assumptions of Inspectorates of Education in these countries on the mechanisms through which they aim to achieve school improvement. These assumptions were used to outline our theoretical framework and to collect two years of survey data of principals in primary and secondary education in these countries. Structural equation modeling was used to construct latent variables, to test our path model and to test differences between countries using multigroup path models. The paper will highlight the methodological benefits and issues of using SEM to study the impact of school inspections (e.g. dealing with missing values, solving measurement problems, determining direct and indirect effects). The results show that inspection primarily drives change indirectly, through encouraging developmental processes, rather than through more direct coercive methods. Specifically, results indicate a strong positive relationship between inspection which encourages school self-evaluation and capacity-building and the growth of key characteristics for improvement such as transformational leadership, better structured teaching and learning, the more effective use of student assessments and increased collaborative planning.

**School Inspection: Varieties of Governance by Evaluation?**

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Austria

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Institute of the Management and Economics of Education (IBB)  
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Inspections are regulatory instruments of public services (Lascoumes & Le Gales, 2007) with a distinct and relatively long tradition. By virtue of their intermediate position inspections are to ensure that the claims formulated by the top levels of politics and administration are translated into appropriate actions and structures on the delivering side of the system. Inspection systems can also be used to probe and explore the current state of a system and to communicate real problems ‘to the top’ and to the public. In the wake of evidence-based reforms of education many European countries have modernized their school inspections (see Altrichter et al, 2013). In this context, inspections are a major instrument of evidence-based governance: they produce evidence in a more ‘localized’ way and they communicate ‘evidence’ and its consequences for school development more directly to schools than performance testing. This paper builds on Ehren et al.’s (2013) work on the mechanisms of effective school inspections. It aims to explore the relevant differences between inspection models in three steps: Firstly; the literature is reviewed to describe different modes of inspection. Secondly, Ehren’s et al (2013) findings of effective inspection mechanisms are used to distinguish and describe ‘typologies’ of inspections systems. Hypotheses are formulated with respect to differential effects of these different inspection ‘types’. Thirdly, a data set of school leaders’ experiences with school inspection in eight European countries (N=2458) is used to test whether principals encounter these different inspection typologies and report of differences in effectiveness of these inspection types.

Common Core Standards: Effective Model for Student Learning? An International Perspective

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OECD
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The U.S. launched a series of major efforts to improve student academic performance and preparation for postsecondary education and the workforce. One of most extensive of these projects is the Common Core State Standards (CCSS) that began in June 2009 that now encompasses nearly all of the United States to develop core academic standards and implement common assessments in English and Language Arts and Mathematics. Adoption of the standards is voluntary and is not regarded as a movement toward a ‘national curriculum.’ Rather, it is an effort to identify the most essential skills and knowledge students need, but does not include information on how to acquire them. These standards are not minor tweaks on existing state standards but are fundamentally different, requiring a more in-depth view of what content and skills students need throughout their schooling and how they should be assessed. This panel begins with a synopsis of the CCSS that provides the context for the subsequent papers, which delve more deeply into what this means for the teaching of reading, mathematics, and assessment. The panel concludes with a description of how the CCSS reflect other efforts by nation states to bring greater continuity and rigor to their educational programs and what challenges they present. Discussants will comment on the international perspective and what this means for educational research globally.

Why the Common Core State Standards (CCSS)
Released in 2010 the Common Core State Standards (CCSS) are an initiative that represented an unprecedented shift away from earlier national curriculum reforms both in content and in support. Established by the National Governors Association (NGA) Center for Best Practice and the Council of Chief State School Officers (CCSSO), the Common Core could be considered a grass root effort by the states to collectively decide what students are to learn and not on how the content is to be taught. This presentation has two parts: (1) to clarify who the major players in the creation of the CCSS are and what has happened since their rollout among the states and school districts; and (2) at the end of the presentation how this effort aligns with other approaches by other countries, as they also attempt to revitalize their educational systems to be more responsive to the demands of a highly skilled labor force.

Implementing the Common Core State Standards in Mathematics for Teachers

William Schmidt
Michigan State University
United States

The Common Core State Standards in Mathematics (CCSSM) have been adopted by nearly every state in the U.S., which represents an unprecedented opportunity to improve U.S. mathematics education and to strengthen the international competitiveness of the American labor force. The hope among educators and policy makers alike is that these new standards are, indeed, ‘world-class’, internationally competitive, and that they will provide America’s children with the rigorous and challenging mathematics education that can lead to improved achievement. This paper describes the challenges teachers face in implementing the standards highlighting why the Common Core Standards in Mathematics may face unexpected outcomes.

Talk, Text, and Transfer: A Triumvirate in Learning and Academic Development

P. Karen Murphy
The Pennsylvania State University
United States

One of the content areas of the Common Core State Standards (CCSS) is English and Language Arts, this presentation highlights why the content of what gets proposed and the rigor associated with it has to consider not only text, but talk and transfer. These constructs also are important for the proposed science standards. The ideas of text, talk, and transfer form the basis of what needs to be considered if the standards are to be effective in their intent. This paper discusses what these constructs entail and their relationship to teacher practice and their implications for implementing the CCSS.

New Assessments for the Common Core State Standards (CCSS)

Michael T. Nettles
Educational Testing Service
United States

This presentation will review the efforts that ETS has taken to assist the states in their assessment practices to meet the CCSS. ETS, a world leader in measurement and research has embarked in a
number of innovative approaches to assessment that is aligned with quality instructional practice and professional development for teachers. Drawing on these new programs, the author will discuss some of the debates and new empirical evidence that can help states meet the goals of CCSS.

**Interplays between dialogical learning and dialogical self: Contributions towards sustainable learn**

Margarida Cesar  
Universidade de Lisboa  
Portugal

Margarida Cesar  
Universidade de Lisboa  
Portugal

Guida de Abreu  
Oxford Brookes University  
United Kingdom

We conceptualise learning as a dialogical process and focus particularly on the interplay across time between dialogical learning and dialogical selves (Ligorio & Cesar; in press). Contributors to this symposium examine dialogical learning and selves in formal educational settings, for example, as described by Cesar; Kumpulainen & Lipponen, and by de Haan, Elbers & Wissink, as well as in informal learning settings, like that described by Davies & Renshaw. Theoretical and methodological issues regarding dialogical learning are critically addressed, as well as the pedagogical practices that contribute to the emergence of new I-positions in the dialogical self (Hermans, 2001). The emergence of different I-positions across time and the resultant potential for tension and conflict is particularly pertinent when addressing how learning proceeds for vulnerable minorities. We analyse examples from different countries and cultures that illuminate the contributions of dialogical inquiry (Kumpulainen & Lipponen, in press), teacher-parent conversations (de Haan et al., in press) and interactive processes within an online community (Davis & Renshaw, in press). Sustainable learning in these contexts is examined by considering changes in participants’ knowledge, socialization, identities and emotions. Normatively, we foreground the value of empowering learners, developing inter- and intra-empowerment mechanisms (Cesar; in press b) so that even vulnerable learners are enabled to become legitimate participants of different learning communities relevant to their futures (Cesar; 2007; Lave & Wenger, 1991).

**Collaborative work and inter- and intra-empowerment mechanisms: Sustainable learning contributions**

Margarida Cesar  
Universidade de Lisboa  
Portugal

During the last decades the Portuguese educational system and schools have experienced many changes related to the new immigrant populations. In particular, teachers’ pedagogical practices and students’ established ways of participating in the classroom have been challenged by the importance afforded to collaborative work. These changes have underlined the need to consider the dialogical self and the conflicts arising from the diverse I-positioning of students, particularly those from vulnerable minorities (Cesar; in press b). We focus on two constructs emerging from the analysis of the data from the Interaction and Knowledge (IK) project: life trajectories of participation and inter- and intra-empowerment mechanisms (Cesar; in press b). The main goal of IK was to study and promote peer interactions in formal educational
scenarios, in order to improve the quality of education. The IK project covered classes from all over Portugal and Cape Verde (mainly 5th to the 12th grades, i.e., 10/11 to 17/18 year-olds). Data collecting instruments were observation, questionnaires, interviews, informal conversations, tasks inspired in projective techniques, an instrument to evaluate students’ abilities and competencies, students’ protocols, documents, and reports. Through a narrative content analysis (Clandinin & Connelly, 1998) inductive categories emerged. The results focus on an in-depth analysis of a paradigmatic dyad. The data suggest that collaborative work examined through dialogical self-theory provides insight into students’ participation, school achievement, mathematical solving strategies, engagement in argumentation, and overall socialisation process. Results also illustrate the importance of inter- and intra-empowerment mechanisms in students’ life trajectories of participation, in and outside school.

The dialogic construction of agency in classroom communities

Kristiina Kumpulainen
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Finland

Lasse Lipponen
University of Helsinki
Finland

This socio-culturally framed study investigates learners’ agency work in two classroom communities, namely in an elementary classroom community and in a teacher education classroom community. The pedagogical culture of these classroom communities is embedded in dialogic learning. Via our analysis based on the conceptual notion of choronotypes, we are interested to illuminate the ways in which students’ agency work is made possible by the creation of dialogic spaces for learners to navigate across their experiences and knowledge(s) situated across time and space. In viewing the processes of learning as relational and transformative, choronotypes can be defined as creative spaces in which students’ agency and identities are negotiated. The results of study illuminate three distinct dimensions of agency that emerged in the discourses of the classroom communities: (a) epistemic agency; (b) relational agency; and (c) transformative agency. In this paper we shall elaborate on these dimensions of agency and illuminate the ways in which these forms of agency manifest themselves in the discourses of the classroom communities. In addition, the study demonstrates that the chronotopic analysis provides a potential tool to capture the dialogic processes of students’ agency work as mediated by the interactions of their past experiences, ongoing involvement, future aspirations and goals that are intended to be accomplished.

School success as a dialogical process: Mediating diversity in pedagogies in multi-cultural schools

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Utrecht University
Netherlands

Ed Elbers
Utrecht University
Netherlands

Inge Wissink
Utrecht University
Netherlands
This presentation will focus on parent-teacher conferences in Dutch primary schools. The study is based on one particular type of conference in which parents and teachers are supposed to come to an agreement on the educational level that applies for the child. From a theoretical perspective on the dialogical nature of culture, our analyses of 34 parent-teacher conferences, focuses on how in conversations between teachers and migrant parents accounts on the school success of the child are differently constructed as compared to conversations with native Dutch parents. The results show that in the conversations with parents with a migration background the issue of effort was more prominently introduced, whereas in the conversations with parents born in the Netherlands, attitudes and personality as conditional factors were more prominent. Moreover, the process through which these accounts were interactively constructed was also different. The culturally relatively large distance between migrant parents and teachers seemed to create either more oppositional or a more one-side processes, while the relatively small distances between the Dutch parents and the teachers allowed for co-creation of explanations for school success. At the same time, the analyses revealed how these conversations were sites of dialogue and mutual learning between parents and teachers. Ultimately the study reveals the possibilities these conversations create for shaping partnerships between parents and teachers to create an understanding of the child’s academic potential across home and school.

**Selves others and the online community at WrongPlanet.com: Dialogic analyses of Asperger Syndrome**

Peter David Renshaw  
The University of Queensland  
Australia

Kim Davies  
The University of Queensland  
Australia

This paper investigates the epistemological and ontological aspects of participating in an online community at WrongPlanet.net. Young people identifying with Asperger Syndrome (AS) come together from across the world at this website for information and support in a dedicated, community-managed and sustainable digital discussion space. Digital communities have a finite lifespan but significant learning about self and others occurs in such spaces because there is a strong sense of shared experiences, of being different from other groups of people, and needing to explore the features of such difference. We analyse a discussion thread formed in response to the question, Why is Asperger’s such a negative thing? Our analysis is grounded theoretically in the dialogical self-theory (Hermans, 2001), and methodologically draws on Bakhtin’s (1975/1981) insights regarding the dialogic nature of self and language. Our findings endorse Berners-Lee’s (1999) advocacy for the World Wide Web as a place where people anywhere in the world can openly express themselves, quickly acquire and convey knowledge, and overcome misunderstandings between people separated in time and space. For the young participants at Wrongplanet.com, the online community was a site for pedagogy and learning, in dialogue with others, about self and others. The ‘curriculum’ emerged iteratively from the sequence of utterances, and the pedagogy involved the opportunity to appropriate the words and perspectives of others whether as authoritative discourse or internally persuasive discourse. It was particularly through negotiations over ‘being Aspie’ or ‘having AS’ that the struggle for personal voice and deeper understanding emerged in the community.

**International Perspectives on Computerized Adaptive Testing**

Franziska Schwabe  
TU Dortmund University  
Germany
Nele McElvany  
TU Dortmund University  
Germany

Franziska Schwabe  
TU Dortmund University  
Germany

Otto Walter  
University of Bielefeld  
Germany

Computerized Adaptive Testing (CAT) has become a popular method to assess students’ abilities in various domains and for differing purposes. Given the impact of assessment for learning and instruction, a critical reflection on advantages and challenges of CAT is a crucial issue for educational practice, politics and research. CAT adapts to the examinee’s ability level during test administration and for this reason, it has also been called tailored testing. The main focus of the symposium is current international research on the transfer of theoretical advantages into operational tests. In particular, attention is drawn to the construction of an item bank for the assessment of ability in the domain of reading (talk I), reduction of the costs of CAT by use of empirical priors (talk II), multiple software to support CAT (talk III), and multi segment adaptive testing as an opportunity to explore different purposes of CATs in one test setting (talk IV). Different approaches will illustrate the wide and complex spectrum of CAT and its application in educational contexts. The presentations will provide a multi-faceted perspective on the topic and will offer opportunities for scientific exchange. Standards and innovations with respect to the implementation of an operational CAT will be discussed. The findings of all four presentations have important implications for innovative measurement taking into account the importance of assessment on the individual as well as on the system level.

Development of a Computerized Adaptive Test of Reading Competence

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Germany

Nele McElvany  
TU Dortmund University  
Germany

Computerized adaptive testing (CAT, e.g., Wainer, 2000) promises a variety of advantages compared to paper-pencil tests. In order to benefit from CAT, a sufficiently large set of construct and psychometrically homogenous items is needed. The aim of this study is the first step during the construction of an operational CAT: the creation of an item bank in the reading domain, which fulfills the requirements of CAT. 385 items are evaluated and calibrated with a sample of N = 1.166 3rd graders in 30 elementary schools. All item parameters are estimated using a one parameter linear logistic test model. The corresponding item parameters are reported for the whole sample and for specific subgroups. The steps during the construction of the instrument are presented and discussed. The instrument is designed to measure reading competencies of 3rd graders. Theoretical possibilities and practical limitations of the implementation of a working CAT are taken into account.

Bayesian Computerized Adaptive Testing
Computerized adaptive testing (CAT) comes with many advantages. Unfortunately, it still is quite expensive to develop and maintain an operational CAT. In this paper, various steps involved in developing an operational CAT are described and literature on these topics is reviewed. Bayesian CAT is introduced as an alternative, and the use of empirical priors is proposed for estimating item and person parameters to reduce the costs of CAT. Methods to elicit empirical priors are presented and two examples are presented that illustrate the advantages of Bayesian CAT. Implications of the use of empirical priors are discussed, limitations are mentioned and some suggestions for further research are formulated.

A small overview of available computer software to support computerized adaptive testing

David Magis
University of Liege
Belgium

The purpose of this talk is to propose a brief overview of several software for computerized adaptive testing (CAT). The selected software are: the R packages catR (Magis & Raμche, 2012) and catlrt (Nydick, 2012), the software Firestar (Choi, 2009) and the web-based platform Concerto (Kosinski & Rust, 2011). The R packages are more intended to provide technical routines to generate CAT response patterns, while Firestar is an integrated software with an end-user interface. Concerto aims at promoting the online development and assessment of adaptive tests. The different CAT software are briefly presented and their advantages and drawbacks, flexibility and usefulness are compared. A small demonstration of the R package catR will be proposed optionally, depending on time limitation.

Multi segment computerized adaptive testing

Theo Eggen
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In developing tests most important is the specification phase where the purpose and the practical conditions in which testing should take place are made clear. Computerized adaptive testing (CAT) was initially developed as a psychometric tool for the efficient estimation of the ability of a student. However in modern times, CAT can fulfill practical conditions and also can have other purposes than estimation of ability. It can for instance be applied in summative but also in formative settings. In the paper attention will be given a number of different algorithms serving different purposes of CATs. In particular the approach of multi segment adaptive testing will be described. A multi segment CAT consists of a number segments, each mini-cats, with their own algorithm, and branching rules. In this approach it possible to have different testing purpose per segment for different parts of the population. The method will be illustrated with Cats that are developed as a part of an operational student monitoring system. In particular, attention is giving to the development and performance of a test for spelling of Dutch words.

Continuing professional development in Teachers, Social interaction
Aims. Recent research on teacher professional development (TPD) and social interaction in school contexts emphasizes the role of teachers as versatile communicators. Teachers need to interact professionally with students, colleagues, parents and administrators. They also need to perform various communicative roles competently and be educational advisors, instructors, understanding peers or content experts. In our symposium, we cast four spotlights on the roles of teachers as communicators from different angles: Firstly, the perspective of teacher-parent communication is focused: Study 1 is an experimental study in which four training conditions of a teacher training program aimed at fostering student teacher’s competencies to talk with parents are compared for their effectiveness. Secondly, the symposium features two studies (one qualitative case-study, one quantitative-qualitative study) that focus teacher-student interaction: Study 2 focuses on a TPD program aimed at fostering teachers’ competencies in social interactions with students in the classroom. Study 3 investigates how teacher questions and feedback predict students’ cognitive activation and motivation in science classrooms. Thirdly, the perspective of teacher-teacher interaction completes the symposium: Study 4 presents findings from a training program aimed at fostering novice teachers’ skills in preparing lessons by cooperating with experienced teachers. Scientific and educational relevance. A multitude of tasks in the teaching profession requires skillful verbal interaction of teachers. This symposium contributes to a growing body of empirical knowledge about which communicative competencies teachers need, about how characteristics of the persons involved in communication influence communicative processes, and about how the development of communicative competencies can be fostered.

Preparing teacher and medical students for communicating professionally through blended learning

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This contribution investigates the efficacy of a communication training developed in two equivalent versions for the domains of medicine and teaching. The blended learning scenario combines video-based e-learning and peer roleplay exercises. Its aim is to prepare students for physician-patient and teacher-parent communication situations, respectively. The training is based upon a theoretical model that differentiates three facets of communicative competence: interpersonal relationship, problem solving, and structuring the conversation. We evaluated the training in two randomized controlled trials comparing three training conditions (e-learning, roleplay, and combined e-learning and roleplay) with control conditions (Study 1: an only-text condition; study 2: a no-treatment condition). Research questions concerned (a) the overall effectiveness of the training as well as potential differential effects (b) on the tree components of communicative competence, and (c) between the participants’ domains. Dependent variables were based on videotaped conversations of the participants with simulated patients / parents. For study 1, t-tests showed no substantial differences in overall communicative competence between the conditions. However, participants in the combined condition performed significantly better in the area of interpersonal relationship. Moreover, no significant differences were found between the domains. In the light of these results, there is no reason to assume our training to be less effective in one or the other domain. However, the study 2 data will hopefully yield further insights here. These are currently under analysis and will be available for presentation at the EARLI 2013 conference.

**Secondary teachers’ developing understanding and classroom practice of dialogic teaching**

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Dialogic teaching (DT) in which teachers and students co-construct knowledge and understanding is effective in fostering learning; yet, it is hard to implement. Research on teachers’ implementation and learning process of DT, especially in secondary education, is scarce. This case-study investigated systematically how two secondary teachers (Mathematics and History) developed their DT
understanding and practices while participating in a blended professional development programme on DT. Using within-case and cross-case analysis, we investigated the teachers’ developing understanding and perceived practices. Data consisted of general and video-stimulated interviews, learning journals and video-recordings. The video-recordings were additionally coded with an analytical framework for the assessment of DT, developed in this study. The teachers used the related notions of democracy and co-learning in interpreting DT. For both teachers, a supportive classroom environment was key in implementing DT. Furthermore, while teaching different subjects, both teachers used similar dialogic strategies such as evoking prior knowledge, positioning oneself as a learner and making the value of dialogue clear. An analytical framework to assess DT in classroom practice was developed in this study, using several objective DT indicators such as the degree to which ideas between participants are taken up and the degree of teachers’ and students’ participation. Using this framework, we found that, though in different ways, both teachers’ classrooms became more supportive and more cumulative (building on each other’s ideas). This largely reflected the teachers’ own experiences. The thick descriptions and dialogic strategies of this study can contribute to further teacher professional development in different subjects.

**Changing mentor teachers’ assistance in talking about teaching and its effects on student teachers**

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In teacher education mentor teachers’ prevalent practice of talking about teaching in internships is to provide feedback and assist student teachers in reflecting on lessons in post-lesson conferences. Content-Focused-Coaching (West & Staub, 2003) is a model for fostering teacher learning that suggests to extend discursive interaction in substantive ways to pre-lesson conferences. In addition, the model suggests the use of a framework of Core Issues for the planning and reflection of lessons that aim to focus on pivotal aspects of lesson design in relation to content-specific processes of learning. In an intervention study these elements were implemented in professional development sessions for mentors on the basis of a 2x2 design. Empirical results from 62 dyads (mentor and student teachers) from five Swiss institutions for teacher education at lower secondary schools show that professional development sessions including the element of pre-lesson conferences did lead mentor teachers to significantly increase collaborative pre-lesson conferences. Furthermore, the respective student teachers experienced a higher degree of assistance in lesson planning and constructive feedback. The introduction of Core Issues in two of the interventions, however, did not have a significant impact on the extent to which particular topics were taken up in lesson conferences or the quality of mentors’ assistance perceived by student teachers. Across intervention groups student teachers’ self-reported learning gains in planning competency at the end of the practicum are positively related to the number of pre-lesson conferences and the quality of the corresponding dialogues. Consequences for the assistance in effective internships are discussed.

**Do teacher questions and feedback predict students’ cognitive activation and intrinsic motivation**

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Verbal teacher-student interactions play an important role in student learning and motivation. In this study we focused on deep-reasoning teacher questions and teacher feedback in classroom talk and studied how teacher statements and girls’ and boys’ characteristics predict cognitive activation and intrinsic motivation. The sample included N = 79 randomly selected high school physics classrooms from Germany and the German-speaking part of Switzerland. Student characteristics (cognitive abilities, pre-knowledge, self-concept and interest) were assessed at the beginning of the school year to identify five student profiles established in previous research. Four months later, classroom talk was videotaped in the same classrooms. The student profiles were incorporated into a new analysis for the present study. In order to answer our research questions, we conducted two-level analysis showing that deep-reasoning teacher questions and teacher feedback predict positively cognitive activation and intrinsic motivation. With regard to gender girls reported less cognitive activation. The ‘strong’ and the ‘overestimating’ profile predicted cognitive activation and intrinsic motivation positively, whereas the ‘underestimating’ and the ‘struggling’ profile predicted both aspects negatively. Negative interactions were found between the ‘struggling’ profile and gender and positive interactions between teacher questions and the ‘underestimating’ profile. Our results indicate that particular pedagogical competencies should be fostered in order to enhance and strengthen teachers’ way of asking and providing feedback. It is argued that teachers’ interactions with different types of students should be promoted.

Multiple Measures of Teaching Quality

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In Europe as well as in North and South America, there is growing interest among researchers, teachers, and policy-makers in useful measures of teaching quality. A variety of measures like teacher self-reports, student ratings, observational and artifact-based approaches are used in research and practice. However, the validity of these measures is often neglected or not sufficiently examined. Our symposium assembles different ways of proving validity. The first paper is concerned with student ratings in primary school. Results show that some common ways of proving validity are not sufficient. Testing the validity of student ratings needs more attention than is usually invested. The second paper reports results on relationships between student, teacher, and observer ratings on different aspects of teaching quality and their perspective specific predictive validity for student learning. The third paper presents empirical evidence for the validity of the Quality Assessment
Notebook, an artifact based instrument focusing on teachers’ classroom assessment practice as an important aspect of high quality teaching. The fourth paper examines the relationship between different measures of teaching quality (like artifacts, video observations, peer interviews, and self-assessments) from the Chilean teacher evaluation system and value added measures of student learning. The underlying question of the contributions is: How can we gain insight into classroom processes and teacher practice in order to gather valid information on the process quality of teaching? The final discussion will concentrate on the relevance and implications of the different answers to these questions of validity.

Student ratings of instructional quality: Do they really measure what they are supposed to measure?

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In German-speaking countries, student perceptions are often used to investigate instructional quality, also in primary school. The process of validation has largely been confined to expert ratings. Empirical research, however, shows that the assumption that respondents understand and interpret items and response categories in the intended way is often not justified (Schwarz, 1999). In our study we explore whether the commonly used methods are sufficient to prove the validity of an instrument or whether more time-consuming methods such as cognitive testing are required. To determine content validity, seven experts took part in a Delphi study and expert discussion. The task was to select valid items out of a larger item pool. Cognitive pretesting investigated how children interpret the selected items. We conducted standardized interviews (90 pupils; 3rd and 4th grades), content analyses (Mayring, 2000), and confirmatory factor analyses (117 pupils; 3rd and 4th grades). The different validation methods yielded divergent results. More than half of the items selected by experts failed when cognitive testing was applied. Some items, which were not comprehensible for the tested children, did not cause problems in the CFA. These results suggest that instruments that have only been validated by a factor analysis and expert ratings should not be trusted. A mixed-method approach to validate new questionnaires appears to be more suitable, especially if young children are the target group.

The predictive value of teaching quality as perceived by students, teachers, and external observers

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The study investigates relationships between student, teacher, and observer ratings of teaching quality and their perspective specific predictive validity for student learning. A further aim was to identify combined measures that represent all three perspectives. Theoretically, we distinguish between three basic dimensions of teaching quality: supportive climate, classroom management, and cognitive activation. These basic dimensions were measured by a student questionnaire, a parallel constructed teacher self-report questionnaire and high-inference rating items judged by external observers. Student outcomes were measured using standardised tests. Results show rather low overall correlations between ratings from different perspectives but considerably higher correlations in the dimension of classroom management. This dimension also predicted student learning achievement from all three perspectives. Cognitive activation and supportive climate were only significant predictors from the observer perspective. Drawing on these results, we specified a latent factor of classroom management with the ratings of students, teachers, and observers as indicators. This factor was a powerful predictor for students’ learning achievement and led to a higher degree of explained variance compared to the single-perspective models. These results show that it is worthwhile to thoroughly examine specific dimensions of teaching quality from different perspectives. Regarding the prediction of student outcomes, results differed between perspectives and between dimensions of teaching quality. The ratings of external observers provided the best predictors for student learning. Identifying combined measures of classroom management contributes to progress in constructing more reliable and powerful predictors of teaching quality that integrate multiple measures.

Measuring Classroom Assessment Practice through teacher portfolios: A study of the QAS notebook

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In this paper we present the results of a pilot validation study of a portfolio instrument developed to measure classroom assessment practice in middle school science. The QAS Notebook (Quality Assessment in Science) is a hybrid that combines features of artifact portfolios and teacher logs, with teacher self-report and reflection. A sample of 42 8th grade science teachers in middle schools throughout California (United States) collected two QAS notebooks each, corresponding to science topics taught in the fall and spring of the 2010-11 school year. The notebooks were scored by trained raters on nine dimensions of assessment practice. Our analyses investigate the reliability and validity of notebook ratings, with particular emphasis on identifying key sources of error in the ratings. The results suggest that variation in teacher practice across notebooks (i.e., over time) was more important than idiosyncratic rater inconsistencies as a source of error in the scores. The validity results point to a dominant factor underlying the ratings, and for some dimensions a convergence of notebook ratings with teacher and student ratings, and predictive power on student achievement. We discuss implications of the results for measuring assessment practice through artifacts, drawing conceptual, methodological, and policy lessons about classroom assessment practice, measurement error in capturing classroom practice, and the dual value of portfolios as instruments for data collection and professional development.

Relationship between multiple measures of teaching quality and student learning: Evidence from Chile

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This paper examines the relationship between multiple measures of teaching quality and student learning in Chilean public secondary schools. We merged data on teaching quality from the national teacher evaluation system with census student achievement data that assessed the same cohort of students at the end of both 8th and 10th grade. We included only teachers in our sample who had been teaching the same group of students during 9th and 10th grade, and who had complete data for at least 10 students. We applied multilevel regression analysis and calculated rank-order correlations between each teacher’s value-added estimates and their results based on the evaluation system’s multiple measures of teaching quality, which include a portfolio of classroom teaching artifacts and a video-taped lesson, a peer interview, supervisor assessments, and a self-assessment. Our study finds a medium-size positive relationship between value-added estimates in Mathematics and teachers’ portfolio instrument results, while relationships with the other instruments are weaker to zero. Correlations are lower in the case of Language instruction, but showing the same pattern across instruments.

Reading motivation: Determinants and consequences

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Previous research has provided strong evidence for the important role of intrinsic reading motivation (RM) in the development of reading comprehension. Consequently, effective programs to foster intrinsic RM have been developed. However, a number of relevant questions regarding the determinants and consequences of RM remain unresolved (Schiefele et al., 2012). For example, it has been rarely investigated whether students’ RM can be increased by means of modifying the motivational style of teachers. In addition, prior research yielded inconsistent results concerning the effects of gender on RM. Also, it is not well understood how intrinsic RM affects comprehension. Finally, there is a lack of research concerning the effects of RM on literary text comprehension. The major goal of this symposium is to address these unresolved questions. Jessie de Naeghel presents a quasi-experimental study evaluating the effects of a teacher training on students’ autonomous RM. The contribution of Sarah McGeown includes two studies investigating the differential effects of biological sex and gender identity on intrinsic and extrinsic RM and students’ book choices. The paper of Ellen Schaffner examines whether reading amount mediates the effects of intrinsic and extrinsic RM on low- and high-level reading comprehension. Sofie Henschel presents a study on different subdimensions of RM and their individual contributions to factual and literary text comprehension.

**Enhancing primary students’ autonomous reading motivation: Impact of an SDT-based teacher training**

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Responding to the declining trend in reading motivation in and beyond the primary school years, the present study aimed to enhance late primary students’ autonomous reading motivation. Towards this end, this study evaluated the impact of a need-supportive teacher training grounded in self-determination theory (SDT) on fifth-grade students’ (n = 664) autonomous motivation for school and leisure-time reading. A quasi-experimental repeated measures design was set up. The experimental condition consisted of teachers (n = 12) participating in a training aimed at providing the knowledge and skills necessary to implement an autonomy-supportive and structuring teaching style, whereas the control condition included teachers (n = 26) who continued their current teaching repertoire. Multilevel piece-wise growth analyses corroborated that students of trained teachers reported increased autonomous reading motivation relative to those in the control group, with the effects
being more prominent for leisure-time reading compared to school-related reading. Students in the experimental group reported an increase in autonomous reading motivation from pretest to posttest in particular, whereas the control group experienced a decline. Additional analyses made clear that boys in particular benefitted from their teachers’ need-supportive training. The findings of the present study complement the SDT literature by corroborating the positive effect of a need-supportive teacher training on late primary students’ autonomous reading motivation.

**Sex, gender identity and children’s motivation to read**

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This talk is concerned with factors which may determine, to some extent, levels of reading motivation among children, focusing specifically on the influence of sex and gender identity in predicting children’s motivation to read. In addition, sex differences in the relationship between reading motivation and likelihood of reading different book types is discussed. Two research studies (Study 1, n = 182; Study 2, n = 223) examine the extent to which children’s sex versus their gender identity (identification with masculine and feminine traits) predict motivation to read and likelihood of reading different books (masculine orientated, feminine orientated and gender neutral books). In both studies it was found that gender identity, rather than sex, better predicted levels of reading motivation among boys and girls. Furthermore, children’s identification with feminine traits rather than masculine traits, was more closely associated with their levels of reading motivation. Study 2 illustrated that while children’s sex predicted their choice of reading masculine or feminine orientated books, the extent to which they identified with feminine traits was a better predictor in choice of gender neutral books. The results are discussed within the context of our current understanding of sex differences in children’s reading motivation. In addition, implications for researchers and educators are discussed and directions for future research are proposed.

**Effects of reading motivation on reading comprehension: Are they mediated by reading amount?**

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Past research has demonstrated positive effects of students’ intrinsic reading motivation (RM) on reading amount and reading comprehension, even when controlling for important cognitive variables (e.g., intelligence). However, the question of whether reading amount mediates the effect of RM on reading comprehension has been rarely investigated. Moreover, the effects of extrinsic RM as well as the distinction between different levels of reading comprehension were neglected. In a sample of 159 fifth-grade elementary students, we examined whether reading amount mediates the effects of intrinsic and extrinsic RM on low-level comprehension (word and sentence comprehension) and high-level comprehension (paragraph and passage comprehension). Correlation analyses showed that both levels of reading comprehension were positively associated with intrinsic RM. In contrast, nonsignificant or negative correlations between the indicators of comprehension and extrinsic RM were obtained. By means of structural equation modeling, it was confirmed that intrinsic and extrinsic RM predicted low- and high-level comprehension indirectly via reading amount. Specifically, positive indirect effects of intrinsic RM and (small) negative indirect effects of extrinsic EM on both levels of reading comprehension were found. Finally, it was confirmed that the effects of RM on high-
level comprehension were retained when controlling for low-level comprehension. /* Style Definitions */ table.MsoNormalTable {mso-style-name:'Normale Tabelle'; mso-tstyle-rowband-size:0; mso-tstyle-colband-size:0; mso-style-noshow:yes; mso-style-priority:99; mso-style-qformat:yes; mso-style-parent:""; mso-padding-alt:0cm 5.4pt 0cm 5.4pt; mso-para-margin-top:0cm; mso-para-margin-right:0cm; mso-para-margin-bottom:10.0pt; mso-para-margin-left:0cm; line-height:115%; mso-pagination:widow-orphan; font-size:11.0pt; font-family:'Calibri','sans-serif'; mso-ascii-font-family:Calibri; mso-ascii-theme-font:minor-latin; mso-hansi-font-family:Calibri; mso-hansi-theme-font:minor-latin;}

Reading motivation and comprehension: Differential relationships depending on the text type?

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Studies on habitual reading motivation (RM) indicate positive relations between intrinsic RM and text comprehension. Extrinsic RM, however, is not or negative correlated with text comprehension. It is largely unknown, which sub-dimensions, in particular of intrinsic RM, are responsible for these relationships. Nor is it clear whether the same correlation pattern can be observed for both literary and factual text comprehension. We therefore investigated whether there are differential relationships between the sub-dimensions of intrinsic/extrinsic RM and literary/factual text comprehension. 1052 9th graders attending the intermediate (Realschule) and the higher (Gymnasium) school tracks completed a questionnaire of RM as well as tests of literary and factual text comprehension. While the sub-dimensions of extrinsic RM are not correlated with text comprehension, object-related intrinsic RM affects both forms of text comprehension equally positive. The experience-related intrinsic RM showed, however, a stronger effect on literary than on factual text comprehension. The results provide further evidence to consider literary and factual text comprehension as partly distinct competencies. Also, further studies are necessary to examine whether there are factors determining the object-related and experience-related reading motivation differentially.

The relation between the approximate number system and mathematics performance

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The approximate number system (ANS) has attracted many research efforts during the last years. It concerns a system that represents numbers (Arabic numbers as well as sets of objects) on a mental number line, i.e. an analogical code and is therefore inherently imprecise (Dehaene, 2001). However, this system enables the child, long before it is taught mathematics, to approximately compare numerosities and find the result of an addition or subtraction problem (e.g. Barth et al., 2005). Therefore, many researchers initially supposed that the ANS is the foundation for the formal development of mathematics. This system could be a domain-specific prerequisite for learning math like for example phonological awareness is for the case of learning to read. However, there are also conflicting results with regard to the value of the ANS as a predictor of mathematics performance. This symposium focuses on several issues in this respect. Attention will be paid to the child’s spontaneous focusing on quantitative relations as predictor of mathematics performance. Another important issue that will be addressed is the value of ANS indices for the distinction between children with and without math difficulties. Finally, two studies will be presented that explored cognitive processes in order to explain both previously found relations between the ANS and mathematics performance as well as conflicting results. Barth, H., La Mont, K., Lipton, J., & Spelke, E. (2005). Abstract number and arithmetic in preschool children. PNAS, 102, 14116-14121. Dehaene, S. (2001).

**Spontaneous focusing on quantitative relations in relation to children’s mathematical skills**

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While only a part of the development of basic cognitive skills takes place during the formal and guided learning situations (Bransford et al., 2006), studies of children’s mathematical abilities have almost solely relied on tasks which are explicitly and unmistakably mathematical. Infants have been found to have innate abilities to compare non-symbolic quantities as described in previous studies of the approximate number system. However, it remains a substantial question how natural number knowledge provides affordances and constraints in the development of quantitative relational skills, such as rational number knowledge. We assessed a cross-sectional sample of 84 kindergarteners’ to third-graders’ Spontaneous Focusing On quantitative Relations (SFOR) in tasks that were not explicitly mathematical, and which could be solved using quantitative relations, exact number, or other non-mathematical aspects. Furthermore, we assessed the children’s general mathematical skills. SFOR tendency was not entirely explained by the ability to use quantitative relations on the tasks. Nevertheless, SFOR tendency was positively associated with the mathematical skills. The findings suggest that SFOR reflects a spontaneous quantitative focusing tendency, which guides a child’s attention towards quantitative relations in non-explicitly mathematical tasks. The self-initiated practice afforded by this process could play an important role in the development of arithmetic abilities in childhood.

**Inhibitory control, not non-symbolic number acuity, correlates with mathematics achievement**

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Researchers have proposed the existence of the Approximate Number System (ANS) which supports the representation and processing of nonsymbolic numerical quantities. Individual differences in children’s performance on tasks designed to measure the ANS have been shown to correlate with mathematics achievement, leading to the suggestion that the ANS underpins the learning of symbolic mathematics. In this presentation we show that, rather than being driven by the precision of underlying representations, the link between ANS performance and mathematics achievement may instead be driven by individual differences in inhibitory control. We report two experiments which demonstrate that the relationship between performance on an ANS task and mathematics achievement differs according to the inhibitory demands of the task, and furthermore that the link between ANS and mathematics performance does not remain after controlling for inhibitory skill. These results suggest that efforts to incorporate ANS tasks into mathematics assessment and intervention may be inappropriate.

**Estimation tasks as predictors of semantic memory and procedural mathematical (dis)abilities**

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A data-driven model-based clustering on 391 children revealed 101 control children correctly clustered as control children. In addition 89 children with mathematical learning disabilities (MLD) were correctly clustered as semantic memory MLD or procedural MLD. However 29 children had a false positive diagnosis and 83 children had a false negative diagnosis. An ANOVA revealed a trend of difference in approximate estimation ($\eta = .03$) between control children and both correctly clustered MLD groups. However the differences between the children with and without MLD were larger for other skills and no significant differences between semantic memory MLD ($n = 46$) and procedural MLD ($n = 43$) were present on those measures. Moreover estimation had no value added in the differentiation between false positive and control children, nor in the differentiation between false negative and children with semantic memory or procedural MLD. Implications of the study to our understanding and assessment of MLD will be discussed.

### Cognitive Mechanisms Underlying Exact and Approximate Number System Addition Skills

Preschool children are able to add and compare small and large, nonsymbolic quantities (e.g. dots) and symbolic quantities (Arabic numbers) approximately. These skills have been regarded as measures of a unitary system known as the Approximate Number System (ANS). Research has shown contradicting results with regard to the predictive role of these measures in children’s developing math achievement and it has been questioned whether they assess one unitary system. This study examined whether different cognitive mechanisms underlie these measures and how they differ from addition problems that call for an exact response with nonsymbolic and symbolic stimuli. Our findings showed that different WM skills underpin small-numerosity exact and approximate addition problems compared to large numerosity approximate addition problems. Visuospatial WM predicted performance in all small-numerosity problems and not in large-numerosity approximate problems. This result is consistent with the view that preschoolers employ a visuospatial mental model in small-
numerosity addition. Moreover, distinctions were found with regard to the underlying number line systems employed with these measures. Large-numerosity ANS measures were predicted by small-range (0-10) nonsymbolic number-line estimation. In contrast, exact small-numerosity addition was predicted by large-range (0-100) symbolic number line estimation, which indicated that preschoolers mentally represented these problems on a more detailed scale. Thus, precision was related to set-size. Small-numerosity ANS measures were not predicted by performance on any number line task; a result that makes their role as ANS measures questionable.

Students’ uptake of technological affordances in collaborative learning environments

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Technological advances in the past two decades have major implication for the design and use of learning environments. As a result, it becomes an important research agenda to understand how technology supports and enhances learning. This symposium provides a forum for discussing studies of collaborative learning, with a focus on different types of technological tools designed to support collaboration and on learners’ uptake of these affordances. Collaboration in technology-enhanced environments encourages and challenges students to be active participants in the learning process, and to mobilize their capacities and resources to provide meaningful contributions to the co-construction of knowledge. Interaction, whether aimed at understanding, using or producing knowledge, or at organizing the collaboration itself, becomes an important aspect in relation to the use of the available technologies. Still, we have limited understanding of how students’ interaction and collaborative strategies influence the uptake of technological affordances. Hence, we want to understand how specific aspects of collaboration (e.g., interaction patterns, distribution of tasks) sets the stage for students’ usage of affordances. Each of the four participants will (a) present a study on students’ uptake of technological affordances in collaborative settings, in secondary and higher education; (b) describe the technology employed for supporting the collaborative activities, i.e., generic collaboration, simulations, modeling software; and c) articulate the main findings in relation to the specific pedagogical designs employed. The methodology relies on mixed-methods for data collection and analysis. The discussion will address these studies’ contribution to a deeper understanding of students’ uptake of technological affordances.

Unpacking the uptake of technological affordances driven by collaboration

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Cindy Hmelo-Silver
Technology-mediated contexts provide a rich learning environment where students have many opportunities to engage in inquiry learning, collaborate with peers and simulate authentic problems. As students interact with contextual features, such as working with real-time data, they are afforded opportunities for participating in scientific practices, including hypothesizing, building and testing models. Collaboration in these complex-learning environments has the potential to make thinking visible and serves as a basis for shared negotiation of understanding. However there is little research about how student interactions and co-construction strategies influence the uptake of technological affordances. This study reports that coordination and flow of peer interactions sets the stage for middle school science students’ uptake of technological affordances to make sense of problems based on aquatic ecosystems.

Collaborative learning in higher education: technological affordances and construction of knowledge

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In this contribution we investigate how student teachers work together in a technological environment that aims to facilitate collaboration and co-construction of knowledge objects. Creating pedagogical settings and technology that supports students to solve problems with open-ended character is a challenge for the current educational practice. We present here an empirical study wherein groups of student teachers work together on knowledge objects (e.g., didactic materials, guidelines or manuals for teachers) intended to address problems signaled in their internship institutions. Groups’ collaborative activities and developing knowledge objects are analyzed with the aim of understanding the mechanisms of these processes. Findings show various degrees of idea sharing and co-elaboration of knowledge objects. We also investigated how technology can support especially the collaborative activities. Functionalities that were used most frequently were those supporting visualization of the object iterations, links to sources and commenting.

Turn-taking affordances and collaboration strategies for note-taking in a shared text editor

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France

Kristine Lund
University of Lyon
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In this paper, we investigate collaborative note-taking in a shared text editor during meetings of dyads with their tutor for a computer programming project. We describe two affordances for turn-taking, one with free access and one with a token which must be obtained to allow writing. In our analysis, we identify a typology of contributions to the shared text editor, and show that certain forms of collaboration strategies (i.e. various contribution patterns) are strongly associated with one turn-taking mechanism or the other. In particular, the free-access editor affords a more rapid-fire
back and forth collaboration style, including reorganization and elaboration on previous parts of the
text, while the token-based editor affords a more equal participation, with participants trading off
writing longer portions of text.

Smart classrooms for knowledge communities: Scaffolding complex inquiry designs

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Technological environments provide scaffolding and orchestration support for materials, tools,
environments and structured interactions. Even the simplest forms of interaction (e.g., reading pages
or filling in multiple choice forms) are typically enacted using technology supports. And more
complex interactions, some of which depend on ‘real-time’ processing of student information (e.g.,
assigning activity conditions based on performance in the previous activity), are practically
impossible without technology. This paper will describe a research program concerned with ‘smart
classrooms,’ where the physical environment, the walls, floor, ceiling and furniture, as well as the
spatial positioning of students within the room, plays a strong role in the scripting and orchestration
of complex collaborative inquiry designs.Collaborating with two elementary school teachers, we
developed a 12-week inquiry curriculum where students investigate an ‘Embedded Phenomenon’-
where a simulation of digital insect colonies was presumed to occupy the four walls of their
classroom. Students engage in a series of activities designed to foster learning of ecosystem concepts
and science practices: documenting the biodiversity through systematic observation of habitats, then
focus on identifying the life cycles of the animal species and finally estimating species populations.
This study developed tablet-based applications that scaffolded students’ observations of the
organisms, and Smartboard applications that aggregated those observations as a collective display,
enabling the teacher to hold strategic discussions. Outcomes will be discussed relating to the use of
our various tools and environments, as well as the orchestration of the script.

Instructional Design for Embodied Learning: Contemporary Cognitive Perspectives

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Traditional cognitive science views the mind as an information processing system with relatively little
consideration of its connection to the external world. In contrast, embodied cognition perspectives
argue that bodily systems have evolved for perception, action and emotion, meaning models of
cognition that ignore bodily experience of the environment are fundamentally limited. Given the
increasing evidence that cognitive processes have deep roots in direct interactions with the world
through the body, it can be argued that instructional designers should broaden their focus from a
purely cognitive focus to develop the learning environments in which learners are supported by
concrete manipulation or physical interaction with instructional materials. This symposium reviews
results from four instructional design experiments informed by embodied cognition perspectives. De
Nooijer et al. examine the effects of imitating video-based modeled gestures at encoding and/or
retrieval on children’s learning of different forms of verbs, providing a direct test of three distinct hypotheses of action word learning. Noting the learning challenges for older learners as a result of working memory declines, Ouwehand et al. compare the effects of instructional videos incorporating gesture-based cues, arrow-based cues or no cues on isomorphic and transfer problem performance in older adults. Castro et al. compare the effects of hand depictions on dynamic versus static visualisations about a non-manipulative task. Hu et al. investigate effects of tracing geometry worked examples on test performance, error rates and cognitive load. Together, these studies identify a range of embodied learning designs, as well as possible boundary conditions for effectiveness.

**Effects of Imitating Gestures during Encoding or Retrieval of Novel Verbs on Test Performance**

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Research has shown that observing and imitating gestures can foster word learning and that imitation might be more beneficial than observation. It is, however, not clear what the most effective manner is in which imitating gestures can be used. In a $2 \times 2 \times 3$ design with between-subjects factors Imitation during Encoding (IE) and Imitation during Retrieval (IR), and within-subjects factor Verb Type (object manipulation, locomotion and abstract), 116 children learned novel verbs. They were provided with a verbal definition and a video of the gesture. Depending on assigned condition, they additionally received no imitation instructions, instructions to imitate the gesture immediately (i.e., during encoding; IE), instructions to imitate (from memory) during the first posttest (i.e. during retrieval; IR), or both (IE-IR). According to the Information Packaging Hypothesis imitation during encoding is most beneficial, while according to the Lexical Retrieval Hypothesis imitation during retrieval is most beneficial. Lastly, the Encoding Specificity Hypothesis would predict that imitation during both encoding and retrieval would lead to the best result. On an immediate and delay posttest, a significant interaction on recall test performance was found, which was caused by the object manipulation verbs. Locomotion and abstract verbs were not differentially affected by instructional method. For object manipulation verbs, IR was most effective, followed by IE and IE-IR (which did not differ from each other). After a one week delay, only IR was more effective than no imitation, which argues in favor of the Lexical Retrieval Hypothesis.

**Do gestures reduce cognitive load and foster learning for older adults?**

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According to cognitive load theory (CLT), the capacity of working memory should be taken into account in instructional design. Because this capacity decreases when we get older it is important to investigate the effects of CLT based instructional techniques for both young and old adults. One of the instructional techniques that have been found to improve learning in young adults is cueing. In addition, research within the theoretical framework of embodied cognition has shown that observing gestures can improve learning by children and young adults. However, nothing is known about the effects of cues and gestures on learning of older adults. The present study investigated whether the use of gestures as cues compared to no cues or arrow cues in instruction can improve performance on isomorphic and transfer problems in older adults. Results showed that a gesture cue instruction led to faster solving of isomorphic problems than instruction without cues. It is concluded that the use of gestures in instruction can improve older adults’ learning to solve problems.

Learning a non-manipulative task showing hands: Opposite effects in dynamic vs. static pictures

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Research in cognitive load theory (CLT) has suggested that dynamic visualisations (i.e. video and animation), due to their transiency, impose a high extrinsic cognitive load on students, which may hinder learning (Ayres & Paas, 2007). As a result, dynamic visualisations appear to be less adequate tools for learning than static visualisations. Nonetheless, when the learning task involves manipulable objects, dynamic visualisations may promote better learning than static equivalents (e.g. Ayres, Marcus, Chan, & Qian, 2009; Wong et al., 2009). In other words, when watching manipulative tasks, their transiency may not overload the working memory capacity of students. This may occur because humans have evolved to learn manipulative skills (Geary, 2002), as part of a grounded or embodied cognition that is more efficient when processing bodily experiences (for a review, see Barsalou, 2008). In line with this argument, hand depictions may be efficient assets to learn from dynamic visualisations, even when concerning non-manipulative tasks (cf. de Koning & Tabbers, 2011). Our experiment compared the effects of hand depictions on dynamic versus static visualisations about a non-manipulative task. We found that animation resulted in higher learning performance than static pictures, but only when the hands were not visible. On the contrary, static pictures were superior to animation when the hands were visible. These results suggest that, for a non-manipulative task, it is important to consider the type of visualisation (dynamic or static), before adding hand depictions that may hinder or assist learning.

A helping hand in geometry learning: Does haptic tracing promote learning from worked examples?
Cognitive Load Theory (CLT) holds that working memory capacity available for learning may be increased if new information is presented through both visual and auditory modalities. To date, CLT-inspired research has not incorporated input from other sensory modalities into the design of instructional materials. The current project investigated whether adding the haptic modality to paper-based instruction emphasising worked examples instructional would enhance learning for novices. The effects of haptic tracing were examined via instructing students to trace out geometry worked examples with their index finger. A series of similar and transfer questions were used to test students’ learning outcomes and a self-report rating scale of test difficulty was used to measure students’ cognitive load during the test phase, as a measure of schema efficiency. Hypotheses were partially supported by the results, with the tracing group making fewer errors than the non-tracing control group. However, a ceiling effect on test performance prevented analysis of this variate. Average ratings of cognitive load across test questions did not differ across conditions, although post-hoc analysis suggested the tracing condition found the ‘farthest transfer’ test question less difficult than the non-tracing condition. These findings provide initial evidence of the benefits of haptic tracing while studying worked examples. These results will inform the design of future studies’ selection of participants and design of experimental materials, to support more sensitive tests of hypotheses.

**Intervention studies in writing-to-learn (part I): Effects on comprehension**

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Writing-to-learn refers to the act of writing as learning activity aimed at increasing students’ learning in content areas. The premise of writing-to-learn is that writing is not a communicative tool only, but also an epistemological tool for acquiring knowledge, developing understanding, and improving thinking skills. This ‘learning through writing’ can be applied in all subject areas, ranging from science to literature, and at various educational levels. This symposium presents contemporary research
about writing as a learning activity and aims at providing an overview of effective use of writing to enhance learning. It also focuses on the implications for educational practice: how can the results of the intervention studies be applied in classrooms? The symposium addresses four intervention studies that examine the effects of writing on different forms of comprehension in various subject areas (e.g., biology, philology). Graham & Harris focus on writing as a tool for improving student’s reading comprehension and show that writing about material that is read enhances students’ comprehension of it. Schmidt et al. show that writing about the personal utility of learning contents in biology improves motivation and therefore comprehension. In the study of Mateos et al. the writing of a synthesis text is assumed to enhance synthetic thinking: the ability to comprehend and integrate conflicting information from different sources in writing. Finally, Breuer shows how constructing patterns of meaning while writing is influenced by the language of writing (L1 versus FL) and by type of planning procedure.

**Improving learning from text through writing: A meta-analysis**

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Students’ educational success depends on their ability to read and critically analyze information presented in text. Despite its importance, many students are not skilled readers by the end of high school. One often overlooked tool for improving students’ reading is writing. Writing about material read enhances comprehension of it. According to the functional view of reading-writing connections writing about text should facilitate comprehension, as it provides students with a tool for visibly and permanently recording, connecting, analyzing, personalizing and manipulating key ideas in text. Instruction that improves writing skills and process should also improve reading skills and processes. Because writers need to make their assumptions and premises explicit as well as observe the rules of logic when composing text, writing should further make them more aware of these same issues in the material they read, improving their comprehension of text. To examine the veracity of these theoretical viewpoints, a meta-analysis involving 95 true-and quasi-experiments was conducted. We found that writing about material read enhances their comprehension of it (ES = 0.37 on norm-referenced tests, ES = .50 researcher-designed tests); teaching writing has a positive carry over effect to improving reading comprehension (ES = .22 norm-referenced tests; .27 researcher designed tests), fluency (ES = .66 norm-referenced and researcher-designed tests), and word reading skills (ES = .66 norm-referenced and researcher designed tests); and increasing how much students’ write has a positive influence on how well students’ comprehend text (ES = .35 on norm-referenced and researcher-designed tests).

**Effects of writing about the personal utility of learning contents on motivation and comprehension**

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Reflecting about the personal utility and value of learning contents is important for learning motivation and, in consequence, for engagement in high quality learning processes. Learning journals are a promising way of reflective writing that offers students ample freedom for reflecting about the meaning and purpose of a particular topic. To investigate the effects of reflective journal writing on students’ learning motivation and their comprehension of subject matter, we conducted a quasi-experimental field study. 40 students of a German secondary school took part in the study. The students wrote a weekly learning journal entry over six weeks as follow-up course work in biology. For writing their journal entries, the students received a brief instruction that either included a personal-utility prompt or not. Results showed that the personal-utility prompt successfully stimulated the students to reflect about the personal utility and value of the learning contents in the learning journals. As a consequence, students in the personal-utility-prompt condition reported greater learning motivation regarding biology and also achieved higher learning outcomes as compared with students who had no personal-utility prompt available. Hence, encouraging students to engage in journal writing as a way to reflect about the personal relevance of learning contents evidently is a beneficial method to increase their motivation for learning a subject and thereby also their comprehension of the subject.

Improving synthetic thinking by integrating conflicting information from various sources in writing

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The overall goal of this study was to assess the effectiveness of two different types of intervention aimed at improving the quality of synthetic thinking, defined as the ability to integrate conflicting information from different sources in writing. The participants were 176 students in the final two years of a psychology degree. Although the aim of both modalities was the same, the intervention with each group was different. In the first, the students had a guide with a graphic format. In the second, in addition to this guide, the different stages of the processes were modelled and explained. The students in the two intervention groups produced two syntheses during the programme working in pairs with the help of the guide. Before and after the intervention the two intervention groups and a control group produced a synthesis working individually without the help of the guide. The degree of integration of conflicting information shown in both individual products was assessed. The students’ perceptions of the change in their competence in integrating conflicting information and of
the utility of the intervention were also assessed. Preliminary analysis indicates that, following the intervention, the self-perceived competence of the students in the guide + modelling modality was higher than that of the students in the guide-only modality.

**Effects of planning and language on constructing patterns of meaning**

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Writing is not only a method of fixing ideas on paper, but it can also be used as a method for thinking. The writers communicate with their texts, which in turn activates new semantic components, and more ideas can come up or existing knowledge can be transformed. However, this communication might work less effectively in FL than in L1 writing because of the different and higher cognitive demands. In order to test this, a study was made in which ten German L1 students wrote academic essays in L1 and FL English. One essay in each language was written after planning by taking notes, one essay each after planning with the help of freewriting. It was analysed whether the amount of generated ideas and the quality of the ideas differed. Indeed, in the note-taking condition, hardly any difference was found, in the freewriting condition, however, the participants were more productive in their L1 and they generated more ideas on a higher level. This means that the text-writer communication worked far more efficiently in L1 than in FL.

**Investigating conceptions, facets and internal prerequisites of financial literacy**

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Given the financial challenges that most European countries are currently facing, financial literacy (i.e. the ability to reasonably deal with financial matters) is becoming an indispensable competence in everyday life and must also be regarded as a key component of political education in a democracy. Thus, its promotion ought to be a core concern for every educational system. This necessity, in turn, presupposes the availability of an adequate and agreed upon framework which helps to guide financial literacy assessment and education. However, instead of a concerted action, the current debate resembles a cacophony of many different purposes and interest groups, yet bearing the danger that not sufficiently reflected intentions may enter the classrooms, and thus potentially hindering sustainable learning and responsible teaching. The symposium aims to support the clarification of this debate by examining what official and individual conceptions of financial literacy do exist, by illuminating facets that financial literacy assessment and education should encompass and by exploring which internal prerequisites may be deemed as essential. More specifically, presentations from three countries (Switzerland, United Kingdom and Germany) are included which
focus on the meso level (curricula) as well as on the micro level (individual learners) of the educational system. In addition, multiple methodological approaches (i.e. content analysis, interviews, tests and questionnaires, comprehensive review) are combined. Based on this stratification, the symposium should enable us to set the stage for the development of a scientifically sound and pedagogically legitimate framework for further investigating financial literacy. Besides, we expect to stimulate a European and international discussion concerning the question of what should be the role of educational research in this context.

**Curricular conceptions of financial literacy: The case of Swiss VET curricula**

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One important starting point to encourage the development of financial literacy is the inclusion of respective learning contents and goals into existing curricula. Thus, the research activities reported here aim to explore two main research questions: (1) To what degree are topics related to financial issues represented in existing secondary level vocational education and training (VET) curricula? and (2) Do the curricular representations differ according to the aspiration level of VET programs and between VET schools? We decided to focus on VET curricula mainly because of the importance that VET assumes in Switzerland as well as for reasons concerned with the particular developmental demands and challenges of this target group. To address the research questions, a curriculum analysis scheme has been developed which draws on two conceptual frameworks: (1) the PISA 2012 financial literacy assessment framework that distinguishes the three perspectives ‘content’, ‘processes’ and ‘context’, and (2) the more socio-politically oriented framework developed by Davies (2012) that additionally takes into account societal aspects of financial literacy. The curriculum analysis includes the official syllabus as well as 25 VET school curricula which cover different VET programs. Among others, the findings of this analysis indicate that most learning goals and contents are rather single-sided and undemanding. In particular, societal concerns are almost inexistent. These findings can inform further analysis steps (i.e. text books, lesson plans). Moreover, the analysis scheme should enable international comparison and exchange, which in turn could contribute to collaborative efforts towards a more comprehensive and educationally sound conception of financial literacy.

**Secondary school students’ understanding of the financial system**

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Financial literacy has been universally defined in terms of personal financial responsibility. This standpoint is problematic in the wake of the 2008 financial crisis and evidence of accusations of banking behaviour which is against the public interest. In this context, we may ask whether schools could play a role in developing informed citizens who are capable of providing a sufficiently knowledgeable and critical electorate to encourage democratic governments to pursue policies towards the financial system which benefit their citizens. However, we currently have very little evidence of students’ understanding of the ways in which financial systems operate, the consequences of banking and government behaviours or factors which affect the sustainability of institutional and national finances. This study addresses this gap in knowledge through interviews.
with 15-16 year-olds attending secondary schools in England. Students were asked to respond to a series of financial issues/problems: A government has a debt amounting to half of the total income of the country. Is this a good thing or a bad thing? Can a bank go bankrupt? If so why? A government is deciding whether to scrap plans to build 500 new schools. How should it work out what to do? Should banks be allowed to charge whatever interest they want to whoever they want? These interview questions were framed to align with categories that have been developed in the literature on personal financial literacy: judging affordability (relationships between income, spending and wealth); risk prediction and management; myopia and time preference; real and nominal values.

Knowledge in and attitudes towards financial issues – results of a pilot study

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While most young people manage their financial situation without severe problems, there is a group at risk: in the group of 18 to 25 year old adults, personal insolvencies are growing (B&gel Wirtschaftsinformation, 2011), possibly followed by poverty and social deprivation (Barry & Breuer, 2012). Whereas financial literacy certainly is not a one-dimensional construct that is solely determined by knowledge about financial issues, it can be argued that certain basic facts about economic and financial issues need to be known to reach informed decisions. Nevertheless, following a broader understanding of competence (cf. Weinert, 2001), apart from knowledge, interest in economic issues seems to be crucial. It can be assumed that persons who are more interested in economic and financial topics engage more in this area. In our study a sample of 189 participants with different educational and working background were tested concerning their financial knowledge and they answered a questionnaire about their interest in financial and economic topics. Results point to large differences in knowledge and show that persons who are more interested in this topic are more knowledgeable as well.

Internal prerequisites for learning and acting in the domain of financial literacy

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The notion of financial literacy is of growing relevance. That refers to curricular activities as well as to the assessment of individual prerequisites for learning about financial issues and for handling the personal income. There is agreement on the general importance of the domain. In the US financial literacy has been proclaimed to be a 21st Century Skill. There are plans for a large scale assessment program on financial literacy at the level of the OECD. A driving force behind this emphasis are the findings about the growing levels of indebtedness and over-indebtedness of especially young adults. While the social statistics on indebtedness and poverty are well-grounded the knowledge about the individual prerequisites of young adults concerning their learning and development processes are rather poor. This is the focus in our R&D activities, which cover the money related constructs of . Self-regulation in handling money,. Knowledge on financial subject-matter,. Perceived social support in handling money,. Self-Concept on the personal financial competence,. Attitudes towards money,. Patterns of handling financial resources,. Experiences in handling financial resources. The constructs have been evaluated for grounding aspects of financial literacy. Instruments for assessment have been adopted and developed. They have been validated. Now there is a series of studies making use to the instruments. These studies come up with basic findings on the prerequisites of young adults within the domain of financial literacy for learning and acting. The paper aims at the presentation of the approach and at the invitation of colleagues for collaborative action and cross-cultural research.
Integrating Cognitive Principles to Improve Mathematics Instructional Design

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Research in cognitive and learning sciences offers many recommendations for instructional design. Studies seeking to identify promising educational strategies typically focus on a single cognitive principle. In contrast, in our proposed symposium, researchers from diverse institutions will present papers that focus on efforts to integrate principles to create enhanced learning environments for mathematics. In the first two presentations, researchers will present the integration of principles in game-based learning environments for mathematics. Wouters and van Oostendorp will present findings that suggest that specific cognition-based instructional support such as reflection, modeling and feedback improves student outcomes. Next, de Jong, van Oostendorp, Elen, Vershaffel, Wouters, ter Vrugte and Vandercruyss, will discuss implementing two cognitive principles in an integrated way to support effective learning without hampering motivation. In the final two presentations, researchers will present findings related to integrating cognitive principles to revise an existing middle school mathematics curriculum. Goldman, Pellegrino, Soffer Goldstein, Heffernan and Heffernan will addresses the questions of: (1) how well have students retained previously ‘mastered’ mathematical concepts given existing practice regimens, and (2) does additional practice of relevant prior concepts aid in the acquisition of new mathematical content? Finally, Schneider, Davenport and Kao will discuss the process and efficacy redesign of a middle school mathematics curriculum using cognitive principles of visual mapping, worked examples, formative assessment, and spacing practice. All presentations will present research findings and address the successes and challenges of integrating cognitive principles to improve instructional design. Following the presentations, Dr. Kenneth Koedinger will serve as discussant.

The importance of cognition-based instructional support in math game-based learning

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Game Based Learning (GBL) often involves complex learning environments which may overwhelm novices. Furthermore, players act and see the outcomes of their actions reflected in changes in the game world which may lead to intuitive learning. These characteristics can make it difficult for learners to engage in effective cognitive processes such as selecting, organizing, and integrating information. Our meta-analysis showed a moderate effect size of $d = .29$ in favor of GBL compared to non-GBL environments ($N = 5547$). For math/arithmetic the effect size was lower ($d = .17$, $N = 2027$). These results imply that specific cognition-based instructional support might be required to increase the effectiveness of GBL, especially for math/arithmetic. A follow-up meta-analysis indeed showed
that instructional support such as reflection, modeling or feedback improves learning in GBL (d = .34, N = 3675, for math/arithmetic: d = .40, N = 172). However, not all types of instructional support were equally effective. In this paper we propose - and support with the meta-analyses - that a well-balanced combination of different types of cognition-based instructional support may increase the effectiveness of math/arithmetic GBL environments without compromising their motivational appeal.

**Reflection and Integration in math game-based learning for vocational students**

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In Game Based Learning (GLB) environments addition, players act and see how the system responds, which may lead to intuitive learning. GBL learning lacks the deep and integrated structure that is characteristic for sustainable knowledge. Cognition-based instructional scaffolds and support may facilitate the acquisition of sustainable knowledge in GBL environments. How can we implement such support effectively without hampering the motivating character of the GBL environment? We introduce a game that implements two cognition-based principles in an integrated way. First, Integration, suggests that cognitive activities used for game play also improve the learning of arithmetic and enhance intrinsic motivation. Second, Reflection, enables players to explicate their knowledge. In a pilot study, we tested a basic version of the game and measurement instruments (using only Integration). Motivation and perception questionnaires proved to be reliable (N = 81). However, a small-scale pretest-posttest group showed no increase in performance after playing the game (p > .05). After revisions, 3 additional game versions were created: a structured reflection...
version (information about math problem solving strategies and then reflection prompts), an open reflection version (only reflection prompts) and an information-only version (information about math problem solving strategies). Currently pretest-posttest experiments are testing the hypothesis that the combination of Integration with Structured Reflection will outperform the other conditions on performance.

**Applying Principles of ‘Spacing’ and ‘Testing’ to Improve Student Learning of Mathematics**

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Two instructional design principles that have received considerable attention in psychological and education research are the spacing of practice across time and formative assessment. Applying these principles to redesign of mathematics curricular materials requires that there be a clear and consistent definition of ‘what’ is being practiced or assessed and ‘when’ it is introduced, practiced, and assessed. We analyzed existing materials to identify concepts that were expected to be mastered prior to a new unit and to determine the practice frequency of these and other concepts in a unit. Next, we pursued empirical studies to assist in structuring the redesign of curricular materials and teacher instructional practice. Our work addresses two questions: how well have students retained previously ‘mastered’ mathematical concepts given existing practice regimens, and does additional practice of relevant prior concepts, with reacquisition of mastery if needed, aid in the acquisition of new mathematical content? Students that practiced a set of previously mastered relevant concepts yielded better performance at the post-test assessing the new unit content than students that practiced a set of concepts not directly germane to the target unit. These findings suggest that it may be beneficial for students to practice and ‘re-master’ concepts that were ostensibly already mastered, especially if those concepts appear frequently in contexts where mastery of new material calls upon them.

**Integrating Cognitive Principles to Redesign a Middle School Math Curriculum**

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Research in cognitive and learning sciences provides a number of recommendations for improving learning and instruction. In the current paper, we describe efforts of a large-scale effort of the National Center on Cognition and Mathematics Instruction (Math Center) in the United States to apply a combination of four cognitive principles to redesign of an existing middle-school mathematics curriculum, the Connected Mathematics Project 2 (CMP2), and test the efficacy of these materials. The four principles are: 1) combining visual with verbal information to promote the integration of concepts, 2) interleaving worked examples and self-explanation prompts with new problems to solve, 3) spacing the learning of critical content and skills over time, and 4) using focused feedback on quizzes and homework. To test whether the revised materials improved student outcomes, we conducted a cluster-randomized control trial. The study focused on four units from the CMP2 curriculum: two 6th-grade units and two 8th-grade units. One hundred and nine 6th and 8th grade teachers experienced with the CMP2 curriculum participated in our study. Teachers represented a wide diversity of schools across seventeen states in the United States. Researcher-developed assessments were used to evaluate student learning. The primary hypothesis-testing analyses used fitting conditional, mixed effects multilevel models. The preliminary results suggest that the principles we selected may have differential effects that may depend on the content or experience of the students. In our conference presentation, we will share the results of our analyses from all four units.

Use of Video to Assess Teachers’ Competencies

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In countries around the world, there have been recent debates about teacher quality and, thus, the competencies essential for teaching. Researchers and policy makers have attempted to articulate these competencies, using categories such as knowledge, instructional practices, and professional vision. However, application of these theoretical categories requires methods for assessing specific teacher competencies. While competencies are often assessed using written tests or questionnaires, there are limitations to these approaches. Paper-and-pencil tests are often decontextualized and engage teachers test-taking, rather than tasks that are central to the work of teaching. In this symposium, we explore four video-based approaches to assessing teachers’ competencies. The four contributions represent variation with respect to which teacher competencies are being assessed and the way that video is used to support assessment of these competencies. Two of the papers explore the use of video to assess teachers’ competencies ‘in action’ (during acts of teaching), and two of the papers explore the use of video to assess teachers’ competencies ‘through reflection’ (while reacting to videos of teaching). Individually, each paper has the potential to make both theoretical and practical contributions. Theoretically, work to assess teacher competencies can help
to refine definitions of these constructs. Practically, the papers contribute methods for assessing teacher competencies that could inform the work of researchers, teacher educators, and policy makers. Collectively, the symposium draws upon these four papers as the basis of a broader conversation about the affordances and constraints entailed in using video to assess teachers’ competencies.

Assessment of Teaching Competencies: Insights into Low-Inference and High-Inference Video Analysis

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There is empirical evidence showing that teaching quality is strongly related to students’ learning outcomes. Therefore, teachers should become experts, through both effective teacher education and learning once they have started to work in the profession. However, there is still little known, on an empirical basis, about the effects of teacher education and regular teaching experience after graduation on teachers’ competencies. In this paper, we use both high-inference and low-inference methods for the analysis and evaluation of video-recorded lessons from pre-service and in-service teachers. Our analysis focuses on the surface-structure (e.g., whole class teaching, group work, individual work), the overall quality of the lesson, and the quality of the cognitive activation of the pupils. The results for the three years of teacher education show an overall increase in teaching competencies for each year. Surprisingly, at the end of teacher education, student teachers reach the level of experienced teachers and, for the first year in profession, almost no further progress was found.

Assessment of Mathematics Teachers’ Abilities to Enact Their Knowledge in Instructional Practices

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Recent work on teacher cognition focuses on teachers’ professional vision or teachers’ competencies that point beyond teacher knowledge and account for the situated nature of knowledge. In response, new assessment methods based on video-vignettes instead of paper-pencil methods try to capture the real-life demands of the teaching profession, allowing relevant cognitive abilities and teacher knowledge to be elicited through situated assessment. In this paper, we describe measures of mathematics teachers’ abilities to enact their professional knowledge in realistic, video-presented teaching situations. The results show that, for secondary as well as primary teachers, the targeted abilities could be elicited. Moreover, measures of these so-called action-related competencies (AC) show only a moderate correlation with paper-pencil measures of teachers’ knowledge. The action-
related measures seem to discriminate between teachers according to their ability to enact knowledge for teaching. Further studies are needed in order to investigate the predictive qualities of these laboratory measures.

Exploring Teachers’ Pedagogical Content Knowledge as Elicited through Two Video-Based Interviews

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This study explores six physics teachers’ pedagogical content knowledge (Shulman, 1986) as revealed through two types of video-based interview. The first interviews were conducted at the end of each teacher’s unit on force and motion and elicited reflections on video clips from his/her video-recorded lessons. The second interviews were conducted approximately one year later and elicited reflections on a standard set of 16 video clips selected from video-recorded lessons and student interviews in the six classrooms. We relied upon both deductive and inductive coding to create a common coding scheme for both sets of interviews. The interviews allowed us to detect seemingly meaningful differences in teachers’ PCK. Overall, the two interviews yielded consistent but complementary portrayals of each teacher’s PCK. All six teachers demonstrated the main features of their PCK consistently across the two interviews. At the same time, each interview foregrounded particular aspects of a teacher’s PCK. Our evidence suggests that paired video-stimulated interviews may be a promising approach for capturing teachers’ PCK. Theoretically, this work can contribute to efforts to operationalize and, thus, to gain further clarity about, the construct of PCK. Educationally, our interviews appear to capture important aspects of teachers’ PCK. This approach could be useful in making experienced teachers’ PCK less tacit and, thus, available to inform teacher education and professional development.

Using Video to Explore Professional Vision of Prospective Teachers of English as a Foreign Language

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This paper describes a research study of the professional vision of prospective teachers of English as a foreign language (EFL). The concept of professional vision was first discussed by Goodwin (1994) and defined as the discursive practices ‘used by members of a profession to shape events in the
domain of professional scrutiny’ (p. 606). In the area of teacher research, professional vision is regarded as consisting of two processes: noticing (what teachers attend to in classroom situations) and knowledge-based reasoning (how teachers use their knowledge to process what they attend to). In our study we focus on the knowledge-based reasoning process, which we define as entailing the following subprocesses: representing, interpreting, explaining, predicting, evaluating, and suggesting alternatives to classroom situations. To explore this concept, we used a video-based e-learning environment (IRSE VideoWeb) to elicit prospective EFL teachers written responses to short video sequences from real lessons. These responses were analysed using qualitative data analysis with a concept-driven coding scheme. In concordance with previous research, the results suggest that prospective teachers comments tend to be more descriptive and evaluative and less interpretative or explanatory. The results are of significance as they inform the professional development of pre-service teachers. Moreover, the developed instrument can be used for investigating and assessing the professional vision of teachers at different career stages.

The education of attention: epistemic topicalization in literacy events in and outside classrooms
Learning theory, Social Aspects of Learning, Social interaction

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In focus for this paper is a concern with how learning can be analyzed and conceptualized as intrinsic to interaction. In particular, the talk focuses on how learners in literacy events in different settings rely on epistemic topicalization for construing their attention to textual content as learnable. Epistemic stance, that is, participants’ ways of marking attitudes toward knowledge and how it was obtained, are the primary means by which participants can establish, sustain, and question intersubjectivity in teaching situations of different kinds. Epistemic stance emerges from interaction between participants in particular dialogic and sequential contexts; it is a public action that is shaped by the talk and stances of other participants in sequentially unfolding turns-at-talk. Recently completed and on-going work shows that participants use a variety of resources for establishing and sustaining a learning orientation. One of these is epistemic topicalization, that is, situations where participants explicitly orient to their attitudes toward knowledge. Epistemic topicalization in literacy events have been found to be frequent both within and outside classrooms. Further, participation in epistemic topicalization seems to vary considerable between different learners. Participants thus socially establish different epistemic ecologies of teaching and learning. The analysis contributes to the growing body of work where micro-analyses of interaction can provide for an emic understanding of learning as social interaction.

Dialogic Literacy: Talking, Reading and Writing together among primary school children

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We analyzed (1) the nature of primary school children’s dialogic interactions while working on collaborative literacy projects, and (2) the relations among oracy and literacy in these collaborative contexts. Our work follows a socio-cultural perspective for understanding learning and development, and attempts to create bridges between conceptualizations of literacy as a social practice, and current ‘dialogic approaches’ to investigating learning and teaching in classroom settings. Participants were 120 Mexican sixth graders. The work of four focal triads was videotaped over an academic year while creating collaborative literacy projects using ICT. Investigation included (1) micro-genetic analyses of peer interactions and dialogue while they read and wrote a variety of texts, as well as (2) longitudinal analyses of the unfolding of oracy and literacy processes overtime. To illustrate our approach to the in-depth micro-analyses of dialogues and texts, we will present representative examples of the dialogical processes displayed by specific focal triads while producing a variety of texts. Results show that (1) the type of task and text children produce influences the style of dialogic interactions they engage in; and (2) there are complex and dynamic inter-textual and inter-contextual interactions between oracy and literacy processes. It is argued that (1) collaborative talking, reading and writing need to be investigated as interrelated, situated social practices, and (2) a dialogic approach to studying classroom interaction in general, and ‘dialogic literacy’ in particular, can contribute to our understanding and harnessing of the processes by which teachers and students construct knowledge jointly.

Spaces and places for literacy and learning: ‘one to one” computers in suburban Sweden

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The paper aims at showing if and how computers provided to 13-14 year-olds by schools (i.e. ‘one to one’-computers) can have an integrating impact on social, physical and virtual spaces and places for literacy and learning. The main theory is Scollon and Scollon’s (2003) geosemiotics (cf. Jones 2010 and Rainbird & Rowsell 2011 for educational applications), providing a framework for the understanding of place in relation to identities of the participants, along with multimodal discourse analysis (e.g. Kress & van Leeuwen 2001; Stenglin 2009) for a semiotic perspective on texts, artefacts and space. The methodology has been described by Björkvall and Engblom (2010) as social semiotic ethnography, combining longitudinal ethnographic observations and documentations of places, spaces and situated literacy activities, primarily those involving computers, with the more detailed semiotic analysis of key texts and artefacts in the every day lives of the participants. The data consist of four students’ self documentations of places in which the computers are used, geosemiotic maps drawn by the students and researchers, researchers’ video recordings of literacy activities at computers, informal interviews, extensive field notes, photos, and students’ texts. The main result discussed in the paper is that the computers allow for unofficial literacy activities (cf. Maybin 2007) to move into the institutional spaces of schools, but that a corresponding movement of official literacy activities into the private spaces of the homes is much harder to achieve, despite being one of the main educational objectives with ‘one to one’ computing.

Constraints and affordances in epistemic practices: Socialization in virtual affinity spaces

Giulia Messina Dahlberg
In this paper, we highlight a perspective on epistemic practices as a distributed endeavor shaped by the affordances and constraints of online synchronous institutional environments. Our interests relate to understanding the students’ ways-with-words and subject positioning in the distributed communicatively framed roles afforded here. This study presents analysis of recorded sessions of an ‘Italian for beginners’ language online course provided by a college in Sweden. The virtual classroom where data for the present study has been generated is made up of a videoconferencing program that allows participants to use oral voice communication, written communication as well as share their individual web-cams. The empirically pushed sociocultural-dialogical analyses are framed in terms of the inherent fluidity of identity positions and languaging. The analysis illustrates firstly, the phases in online affinity learning spaces and secondly, the dialectic between the phases of online sessions and the ways in which a range of activity types and literacy events shape interactional patterns across the boundaries in virtual affinity spaces. The results of the study contribute towards an understanding of how the written word shapes epistemic practices in online institutional settings in terms of affordances, but also constraints for the participants.

**Formative feedback in online interaction to enhance learning**

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Feedback is regarded as one of the essential tools to support learning in online environments. These environments’ characteristics, especially the multidirectional interaction within them, the possibility they afford to make use of different types of digital media and the transparent and permanent availability of the contributions from teachers and students, they all entail changes to the way feedback is given, received and used. The symposium’s main objective is to identify and discuss how teachers, learners or peers and technology offer feedback in online environments in order to enhance learning. In this regard, the first paper will make a valuable contribution to the debate around the added value of structuring feedback within a wiki based in a collaborative environment. The second paper presents a model to study the quality levels of given online peer feedback in Virtual Action Learning. The third focuses on how learners implement the feedback received from their teachers or their peers, and its effect on learning in online environments. Finally, the fourth paper discusses how feedback can be best shared between teachers and learners, but how it is also the teacher’s main responsibility in an online collaborative environment within a small group. The
symposium’s final objective is to contrast and link these different perspectives in order to better understand the characteristics and quality of the feedback offered by various sources in online interactions, and to identify the educational implications in designing and implementing effective feedback in online teaching and learning environments.

**Structuring Peer Assessment: Impact on Product Improvement, Students’ Perception and Feedback Quality**

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This research focuses on the added value of structuring peer assessment and peer feedback in a wiki-based computer-supported collaborative learning environment. First year university students, enrolled in an educational sciences program were asked to collaborate in small groups and give each other feedback on writing assignments in a wiki environment. Two subsequent studies were set up. The main aim was to study the product improvement and students’ perception of peer feedback (study 1 & 2), as well as the quality of students’ feedback (study 2). In the first study, two conditions were applied: Non-structured peer feedback control condition (NS-PFB) and Basic structured peer feedback (BS-PFB). The second study also involved an extra condition: Elaborated structured peer feedback (ES-PFB). Results of the first study showed that although the wiki product improved significantly between pretest and posttest, there was no significant difference in product quality between the two conditions. However, the BS-PFB group perceived the quality of the received peer feedback as being more profound and detailed. Furthermore, the BS-PFB group reported to adopt a more critical attitude when both providing and receiving peer feedback. Data of the second study is currently gathered, and results are to be presented. It is hypothesized that the elaborated structured feedback condition will lead to higher levels of feedback.

**Quality levels of given online peer feedback**

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A new perspective on using online peer feedback is found in the concept of Virtual Action Learning (VAL) (Baeten, 2009). The online peer feedback in VAL is defined as peer tutoring (Topping & Ehly, 1998). In VAL students use the peer feedback they give online to their peers as evidence for their
development of their own competencies. Dochy, Segers and Sluijsmans (1999) and Topping, Smith, Swanson and Elliot (2000) found that students have difficulty in giving feedback to their peers. From practice we found that most of the peer feedback that is given in VAL by students can’t be used as evidence as it lacks quality. Next to this the peer feedback that is validated by assessor as high quality feedback shows a high variety of quality. This study focuses on finding an approach that supports this high variety. It aims to get more insight in the quality of given online peer feedback in order to support students to improve the quality of their given peer feedback and support assessors to improve the validation of online peer feedback. The main research question is: ‘What are the quality levels of online given peer feedback in Virtual Action Learning?’ A theoretical model is presented, that will be tested on existing data.

**Distribution of feedback between teacher and students in online interaction**

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This study explores the characteristics and the distribution of feedback between teacher and students interacting in an online collaborative learning environment. Responsibility for formative feedback is shared between teacher and students and involves multiple dimensions of the knowledge construction process. The data analyzed consist of 1185 contributions posted by the teacher and two small groups of students working on a rubric for assessing teaching competencies. The results show that the feedback is distributed between teacher and students, but also that teacher feedback is crucial for supporting and validating knowledge construction through online interaction. Furthermore they show differences between teacher and student feedback in three areas: (1) the focus (learning content, academic task, and social participation); (2) the type (verification vs. elaboration); and (3) the stage in the teacher-student online interaction at which the feedback is delivered. Taken together, the results broaden our understanding of teacher and peer feedback in online collaborative learning environments and show that a multidimensional approach to the study of formative feedback can help to understand its complexity.

**Harnessing formative feedback: effect of feedback in the writing process in online interaction**
The purpose of this paper is to provide evidence of how students implement teacher feedback and peer feedback and its effect on students’ writing in order to contribute to the quality of learning. Feedback is conceptualised as part of a dialogic process carried out in an asynchronous written environment which helps the students to progressively assume learning objectives with the purpose of improving learning. However, research on feedback has focused more on feedback design than on how students utilise or implement it. The research was carried out within the virtual campus of the Open University of Catalonia. The quasi-experimental study took place in a 15-week, 6 EC module in the Psychology Bachelor’s degree. Students were randomly assigned to 8 experimental groups which varied in respect of the type of feedback (corrective, epistemic, suggestive, and epistemic+suggestive), and the feedback-giver. The educational implications of the study allow for improvements in teaching-learning practices in online environments. Two main implications stand out; one linked to feedback planning and another linked to the quality of feedback. In relation to feedback planning, the results obtained highlight the need to plan activities which will allow teachers to gather evidence that students implement feedback into their texts. With regards to feedback quality, feedback implementation can be considered one of the main issues to take into account. This means that feedback could be of greater or lesser quality to the extent to which the students harness it and introduce changes in learning.

Methods for Research on Conceptual Change: Recent Advances and Future Challenges

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How do learners acquire a conceptual understanding in a domain? How do they react to incompatibilities between their prior knowledge and new insights? How can learners restructure their knowledge in order to integrate new information?, These are some of the questions that are asked in research on conceptual change. Measuring and modeling conceptual knowledge structures has been a challenge for research on conceptual change for decades. Over the last years, researchers
have made advances by adapting methods from psychometrics, e.g., IRT models and structural equation models. The four contributions to the symposium are examples of this recent development. The first study uses latent profile analyses to examine commonalities and differences of German and American teachers’ conceptions of gifted students. The second contribution describes the development of a comprehensive test of students’ rational number concepts in a large sample of children from 4th to 12th grade. The influence of whole-number prior knowledge on different groups of items was investigated using IRT models. The third study traced longitudinal changes in students’ understanding of rational number by means of a latent transition model. The fourth contribution reports results from another latent transition model, which was used to trace students’ changes between profiles of fragmented or integrated knowledge over three measurement points. Overall, the four studies cover content domains from Mathematics, the Social Sciences and the Natural Sciences, as well as a variety of different quantitative methods for modeling patterns of conceptual change in relation to culture, instruction, and age.

**German and American Teachers’ Conceptions of Gifted Students: A Cross-Cultural Comparison**

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Do teachers hold different conceptions of gifted relative to average-ability students? Using an experimental vignette approach and latent profile analysis, this paper expands on prior results by the first two authors, who had found teachers to distinguish between students described as gifted vs. average-ability along three dimensions (intellect/achievement, antisocial behavior, and creativity). Their findings were in line with the so-called disharmony hypothesis, with gifted students being conceived of as more intelligent, achieving at a higher level, and more creative, but also as more antisocial. Furthermore, different rater types were distinguished. For the cultural comparison we attempt in the current study, data from a sample of 323 prospective and practicing teachers will be augmented by ratings from about 200 teachers from the United States. In doing so, we will focus on the following questions: (1) Can the structure of teachers’ implicit theories be replicated across cultures, and (2) are similar types and proportions of raters assessing the vignettes be identified? The results are expected to offer interesting insights into teachers’ implicit theories and the factors that influence them across two cultures. This comparison is particularly interesting due to very different traditions in Germany and the US regarding gifted identification and education, especially in the light of common stereotypes about the gifted.

**Inhibiting Natural Number Knowledge in Rational Number Tasks: Towards a Comprehensive Test**

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A major difficulty in solving rational number tasks is the inappropriate application of natural number knowledge. Problems occur when the rules for natural numbers are no longer applicable for rational numbers (Vamvakoussi & Vosniadou, 2010). The literature points out different aspects of rational numbers where this occurs: density, operations, representation, and size. While there has been a large number of studies about each of the four aspects, there is, to our knowledge, no single study that integrates them all. Based on a literature review and curriculum analysis, a test was created including the four aspects, which was validated in 1343 students between 4th and 12th grade. This test enabled us to map the development of rational number reasoning the four aforementioned aspects. A significant overall improvement in performance with age was found. There was a significant effect of congruence, indicating that students perform better on items where relying on natural number knowledge leads to the correct answer than on items where this leads to the incorrect answer. Finally, the moment in which progress is made differs from aspect to aspect. For instance, while understanding of the size of rational numbers develops already through primary school, the idea of density of the rational number system remains particularly difficult even at the end of secondary education. Besides the mapped development of rational number understanding, the developed instrument will be useful in future research, e.g. for comparative research, to measure the effect of specific interventions, or to correlate to natural number sense.

Developmental Trajectories of Rational Number Concept(s): Modelling with Latent Transition Analysis

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Conceptual change with rational numbers is a complex phenomenon, which involves a number of different sub-concepts. The present study focuses on three such sub-concepts; comparison, ordering, and density of fractions and/or decimals. While difficulties with rational number concepts have been seen in students’ learning trajectories and even educated adults, little is known about the developmental trajectories of the separate sub-concepts. Latent variable analyses such as Latent Profile/Class Analysis (LPA/LCA) and Latent Transition Analysis (LTA) stand to provide substantial added-value over traditional methods such as cluster analysis to the examination of complex developmental processes such as conceptual change. To this end, we measured 265 10-12 year-old students’ conceptual knowledge of rational numbers, before and after their regular fraction and decimal courses. Traditional cluster analysis indicated that conceptual knowledge of rational number density was connected to high scores in both comparison and ordering. LCA indicated that a four-
class structure was most appropriate for pre- and post-test scores. LCA showed that knowledge of rational number ordering and comparison were necessary, but not sufficient for having knowledge of density concepts. LTA indicates that substantial development of concepts of density occur only in a small number of students, who already have a basic understanding of density concepts and a well-developed understanding of rational number order prior to fraction and decimal teaching. These findings suggest that latent variable analyses can highlight differences in the developmental trajectories of different sub-concepts of rational numbers.

**Inconsistent Knowledge in Children’s Pathways of Conceptual Change: A Latent Transition Analysis**

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Conceptual change requires learners to restructure parts of their conceptual knowledge base. Prior research has identified the fragmentation and the integration of knowledge as two important component processes of knowledge restructuring but remains unclear as to their relative importance and the time of their occurrence during development. Previous studies were mostly based on the categorization of answers in interview studies and led to mixed empirical results, suggesting that methodological improvements might be helpful. We assessed 161 third-graders’ knowledge about floating and sinking of objects in liquids at three measurement points by means of multiple-choice tests. The tests assessed how strongly the children agreed with commonly found but mutually incompatible statements about floating and sinking. A latent profile transition analysis of the test scores revealed five profiles, some of which indicated the co-existence of inconsistent pieces of knowledge in learners. The majority of students (66%) were on one of seven developmental pathways between these profiles. Thus, a child’s knowledge profile at a point in time can be used to predict further development. The degree of knowledge integration decreased on some individual developmental paths, increased on others, and remained stable on still others. The study demonstrates the usefulness of explicit quantitative models of conceptual change. The results support a constructivist perspective on conceptual development, in which developmental changes of a learner’s knowledge base result from idiosyncratic, yet systematic knowledge construction processes.

**The Impact of Teacher Expertise on Students’ Learning and Processing**

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Content knowledge and pedagogical content knowledge are claimed to be crucial prerequisites for effective teaching. For instance, research has shown that rich and flexible understanding of subject matter is needed in order to be able to foster students’ understanding and problem solving skills in a subject domain. However, their very domain expertise can make it difficult for experts to anticipate students’ knowledge, which could lead to a maladaptation of experts’ instruction (expert blind spot). Teachers also need a well-developed basis of pedagogical content knowledge, for instance, about students’ misconceptions or optimal representations for making content comprehensible, in order to effectively support students’ learning. However, the different patterns and interactions of content knowledge and pedagogical content knowledge and effects of content knowledge and pedagogical content knowledge on students’ learning remain largely unexplored: How do experts’ omissions during instruction affect students’ learning and motivation (Feldon & Chao)? Do intermediates’ and experts’ explanations differently trigger novices’ comprehension processing (Lachner & Nueckles)? How do novice and experienced teachers differ in their perception of classroom events (Wolff, Bogert, Jarodzka & Boshuizen)? Which effect does teachers’ pedagogical content knowledge have on assessing students’ knowledge (Wittwer, Herppich, Nueckles & Renkl)? These are the central questions the symposium will address. The unifying aim of the symposium is to clarify the impact of teachers’ content knowledge and pedagogical content knowledge for teaching to effectively support students’ learning.

Analysis of Experts’ Omissions during Instruction: Impacts on Student Learning and Motivation

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When explaining how they perform tasks within their domains of expertise, experts frequently omit information unintentionally that is necessary to replicate their strategies. This has the hypothesized effect of raising learners’ extraneous cognitive load when they rely on those explanations for instruction, which can negatively impact both motivation and performance. However, cognitive task analysis (CTA) is an effective tool for eliciting more complete expert knowledge, which can then be incorporated into instructional design efforts. This double-blind study examined the effects of CTA-based instruction on learners’ motivation and performance in an introductory biology research course for undergraduates (n = 2,079). Results indicate that self-efficacy and task value to the target task (reporting experimental findings from a biology laboratory experiment) increased more frequently in the CTA-based instructional condition than in the control condition. Further, task performance was significantly higher for lower ability students (expertise reversal effect). The results presented here indicate that such omissions can produce effects consistent with predictions of cognitive load theory as well as motivational perspectives. CTA represents a potentially effective strategy to mitigate these effects by reducing the amount of material omitted from instructional explanations.

Instructors’ Expertise Affects Students’ Processing? Deep Coherence Supports Deep Processing
Research on expertise has provided evidence that domain experts are prone to an expert blind spot. For example, when instructing novices on domain-specific issues, they tend to underestimate how difficult it may be for a novice to understand the meaning of specialist concepts. Irrespective of this well-known egocentric bias, we found in a recent study that instructional explanations generated by domain experts better enabled novices to acquire transferable knowledge as compared to the more detailed but considerably less coherent explanations of intermediates. To investigate how experts’ and intermediates’ explanations differently triggered novices’ comprehension processes, we conducted a thinking-aloud experiment. By analyzing novices’ sequences of comprehension processes, we constructed process models for novices learning from either experts’ or intermediates’ explanations. The results showed that novices learning with a highly coherent expert’s explanation mainly followed a cyclical-interactive deep-processing approach by generating self-explanations and bridging inferences. On the other hand, novices learning with a less coherent intermediate’s explanation were mainly engaged in shallow processing by paraphrasing and sequentially processing the explanation. Thus, although it may sometimes be difficult for experts to anticipate the potential comprehension difficulties of novices, the high coherence of their explanations nevertheless acts as a valuable scaffold, enabling novices to construct meaningful and flexible knowledge by engaging them in deep and focused processing.

**Does Teaching Experience Influence the Way Tutors Address a Tutee’s Knowledge Deficits?**

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Human tutoring provides tutors with the opportunity to address a tutee’s knowledge deficits. This requires tutors not only to let tutees express their knowledge deficits but also to detect the knowledge deficits in order to respond to them appropriately. Research shows, however, that tutors in general have difficulty with doing so. Even so, no study so far has directly examined the ability to address a tutee’s knowledge deficits as a function of a tutor’s expertise. Therefore, we compared the tutoring interactions between n = 21 classroom teachers as teacher tutors and n = 25 university students as student tutors. The results showed that all tutors dominated the tutoring dialogues, irrespective of the level of their teaching experience. However, tutees of teacher tutors more often contributed to the tutoring dialogue than did tutees of student tutors. At the same time, tutees of
teacher tutors expressed more knowledge deficits than did tutees of student tutors. Contrary to our assumptions, teacher tutors failed to detect a tutee’s knowledge deficits more often than student tutors. Instead, all tutors were surprisingly good at uncovering a tutee’s knowledge deficits. The results suggest that tutoring of teacher tutors are more interactive because teacher tutors let tutees more actively participate in tutoring than do student tutors.

**Differences in Experienced and Student Teachers’ Perceptions of Classroom Management Events**

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Classroom management represents a vital, multi-faceted skill and knowledge set for achieving student learning gains, but represents a considerable challenge for beginning teachers. Understanding how experienced teachers execute this skill and determining the ways in which their abilities vary from inexperienced teachers may offer a means of improving novices’ skill development. Verbalizations based on experienced and student teachers’ perceptions and interpretations of authentic classroom scenes were analyzed to identify differences associated with distinct stages of professional skill development. Mixed-method analysis of participant verbalizations yielded a number of significant expertise-based effects. Grounded theory methodology was used to develop a coding scheme appropriate for analyzing teachers’ descriptions of relevant classroom management events observed in authentic lesson videos. Four categories of codes emerged, relating to the kind of description/interpretation, the topic and focus of statements, time references, and the aggregated cognitive processing expressed. Differences were found in terms of the perceptions, topics, and foci articulated by experienced and student teachers. Prime examples of expertise-based effects identified through analysis include student learning, student discipline, and teacher interaction. Experts’ concerns focused on the learning taking place in the classroom and the teacher’s ability to influence learning, whereas novices’ concerns had more to do with maintaining discipline and classroom behavioral norms. This means that teachers’ perception and interpretations of classroom learning diverges significantly based on expertise level, which could have significant implications for orienting classroom management concerns addressed in teacher training programs.

**Analysing sequential and temporal characteristics of Social and Self-regulated learning**

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The conceptualization of self and social regulated learning (S-SRL) has recently received much attention. Researchers are starting to view S-SRL as a series of events. A series of events can be perceived as a process that unfolds over time in a certain order. This raises new questions with regard to the characteristics of the S-SRL process and its dynamic interplay with student characteristics and context characteristics. Addressing these issues demands for in-depth analysis of the S-SRL process to understand how S-SRL mediates the relationship between students characteristics, contexts characteristics and performance. However until now the S-SRL process is mostly studied by counting the number of self-regulating learning activities students perform. The process is often taken as one holistic unit and the sequential and temporal aspects are ignored. Several researchers have expressed the need for research into the sequential and temporal characteristics of SRL. The objective of this symposium is to illustrate how empirical studies of sequential and temporal characteristics provide new insights that enhance our theoretical and practical understanding of S-SRL. The 4 empirical contributions show how emerging methods are used to explore time and order in the S-SRL process. The discussant will discuss the commonalities and differences among the methods and findings and provide guidelines to work towards a uniform understanding of the sequential and temporal character of SRL.

How do students adaptively regulate learning in the face of academic challenge?

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Consistent with the theme of the symposium, this paper demonstrates two analytic techniques for examining the temporal and sequential aspects of SRL. The purpose of this study was to examine how learners adaptively regulate learning over 11 consecutive weeks. Three research questions were addressed: (1) Do students regulate by experimenting with new strategies when they encounter similar challenges in the future? (2) Do students continually encounter similar challenges in consecutive weeks (indicating maladaptive regulation, (3) How do students who evidence adaptive regulation differ from those who evidence maladaptive regulation in terms of (a) quality and specificity of study goals, (b) confidence in goal attainment, (c) perceptions of goal attainment, and (d) self-evaluations of strategy effectiveness. Conditional probability matrixes and multi-level modelling were used to examine intra-individual differences in regulation over time. Findings identified students who exhibited adaptive versus stable patterns in terms of regulating challenges and self-reported strategy use. Multilevel modelling described precise differences between these groups in terms of goals, goal attainment, and confidence over 11 weeks of studying.
How to recognize socially shared regulation? – Sequential analysis of chats and logs in CSCL

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The increasing amount of empirical research shows that the role of regulatory processes is critical in CSCL and collaborative learning settings (e.g. Chan, 2012; Volet et al., 2009; Kempler Rogat & Linnenbrink-Garcia, 2011; Saab, 2012). However, the current conceptual definitions and specificity of the findings vary. This is especially the case in differing and defining the co-regulation and share regulation processes. The aim of this study is to understand shared regulation in CSCL in more details. Sequential analysis of chats and log file traces will be matched to find evidence whether the students act as they plan to do and whether the collaboratively planned regulatory activities become shared in practice. The research questions are: 1) What kind of shared regulatory processes the students activate when planning and working with collaborative tasks? 2) How effective is shared regulation to collaborative learning results? The results show that we are able to find out whether the collaborative planned regulatory activities become shared in practice. For example, the groups who achieved good learning results used more multiple regulatory processes to support their learning and also reach a level of shared regulation. Later, we will provide more detailed analysis on how these shared regulatory processes evolve during seven weeks. In the paper the pros and cons of logfile traces and process oriented data when investigating regulatory processes in CSCL will be discussed.

Analyzing Temporally Unfolding Self-Regulatory Process during Learning with Multi-Agent Technologies

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We used a multi-methods approach to converge multi-channel data from 60 undergraduate students who were randomly assigned to one of three experimental conditions and used MetaTutor (a multi-agent intelligent tutoring system) to learn about a body system for two hours. During the learning session, we collected product (e.g., pretest, posttest, quiz scores, summaries of the science content), process (e.g., concurrent think-alouds, eye-tracking, log-files, physiological data, screen recordings, metacognitive judgments, and notes and drawings), and self-report (on emotions and motivation) data to analyze the roles of cognitive, affective, metacognitive, and motivational (CAMM) processes during learning about the topic with the agent-based system. Several traditional and educational data mining techniques were used to analyze the complex data. Results indicate that those assigned to the prompt and feedback conditions significantly outperformed those in the other two conditions. Multi-channel data also show how different behavioral signatures may be related to learners’ deployment of CAMM processes during learning. We will illustrate and describe how these data (1) were mined to understand the temporal deployment of SRL processes and (2) how to use multi-channel data to design intelligent, multi-agent systems to be more responsive to students’ thinking and feelings during learning about complex and challenging topics.

Analyzing temporal sequences among cognitive and regulative activities during collaborative learning

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This paper focuses on analyzing the sequential and temporal relations between cognition and social regulation during collaborative learning. We know that regulative activities such as metacognitive (i.e., planning, monitoring) and relational activities (i.e., confirming, engaging) contribute significantly to students’ learning. Yet, we know very little about how these social regulative activities influence cognitive activities at a micro level during collaborative learning. Therefore, this paper explores how sequences of students’ cognitive, metacognitive and relational activities affect the likelihoods of subsequent low and high cognitive activities during collaborative learning and whether these relationships differ across time using statistical discourse analysis. We found that both low and high cognition had long lasting positive effects, increasing the likelihood of subsequent low or high cognition over 6 turns. Both planning and evaluation mediate low and high cognition, whereas monitoring only mediates low cognition. Orientation on the other hand reduced the likelihood of subsequent low cognition. A frequently found sequence was planning followed by low cognitions followed by high cognitions. Moreover, positive relational activities (confirm, engage) support low cognition whereas, denying has a negative effect on high cognition. These findings indicate that there are reoccurring sequential relations among students cognition and social regulation. Insights into these patterns can support tracing of students’ activities and the formulation of guidelines for adaptive scaffolding.

What can be learned from secondary analyses of data from large-scale educational assessments?

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The primary aim of large-scale educational assessments is to evaluate the outcomes of the educational system. Assessment reports heavily focus on such descriptions of student performance. However, the data collected in these assessments, usually from large, representative samples, can yield much more educationally relevant information, by carrying out targeted secondary analyses on the data. The current symposium brings together four such enterprises; all carried out in the field of large-scale mathematical competence assessments. The studies involve data from three different countries, and address both primary and secondary education. Because large-scale assessment data pose statistical challenges, most contributions involve advanced psychometric modeling. The first two contributions take the achievement data as starting point, by investigating qualitative differences between students in the domain of algebra in Flanders, and addressing the similarities and differences between mathematical competence as assessed in an international assessment and in a German national standard-based test. In the last two contributions, attention is refocused from achievement to how students obtained their answer, i.e., what solution strategy they used. To that end, the written work of sixth graders participating in the most recent Dutch national assessment was coded for strategy use; once for mental arithmetic problems and once for more complex multi-digit arithmetic problems. The educational significance of the studies’ findings is discussed by an expert in the field of mathematics education and mathematical competence, Joke Torbeyns (KU Leuven, Belgium).

**Formative conclusions from national assessments: Qualitative differences in mastery of algebra**

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National assessments serve as an element in the educational quality control system. Flanders started conducting national assessments in 2002. National assessments primarily serve a summative purpose: to what extent are the educational goals reached by our students? Policymakers and educational practitioners, however, also expect to be able to draw more formative conclusions from these assessments. Are there specific topics that pose problems for specific groups of students? In this paper it is illustrated how mixture IRT models can be an addition to the traditional way of reporting on national assessments. Analyses using data from the 2009 national assessment on mathematics in the first stage of secondary education show that two subgroups of students experience specific problems when using polynomials, each consisting of about one third of the students. One group had trouble working with special factoring while another group actually only seemed to master basic items with regard to first degree equations. The results are also linked to background information that is collected in the national assessments.

**Examining the curricular validity of standard-based tests with multidimensional and multilevel IRT**

Johannes Hartig
Within Germany, standard-based tests were developed as an alternative to the use of tests from international studies for within-country educational evaluation. Based on a sample of \( N = 9,577 \) ninth graders, the similarities and differences of mathematical competence assessed with a German standard-based test and with the international PISA 2006 test were examined. Latent correlations estimated with multidimensional Rasch models show a very high overlap between mathematical competence in both tests (\( r = .94 \)). Multilevel Rasch models were applied to estimate the variance between schools and between school tracks for the assessed competence. The amount of variance between schools is substantially higher for the standard-based test (59%) than for the PISA tests (49%). Results support the stronger curricular validity of the standard-based test for mathematical competence and illustrate that correlations alone draw an incomplete picture of a test’s validity.

**Measuring mental arithmetic competence: What about students using written standard strategies?**

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The current paper presents a first exploration with respect to differences in strategy use between problems that are intended to measure mental arithmetic competence in a large-scale national assessment in the Netherlands. The need for this study comes from a recent re-definition by the Dutch government of what is mental arithmetic: it changed from calculating in the head to calculating with the head, i.e. allowing the use of scrap paper. A consequence of this re-definition, however, is that it opens the undesired possibility that students use written standard strategies. In the current study, strategy use on 19 mental arithmetic problems that were administered as a part of an incomplete linked design in the National Assessment (PPON) is investigated. Each problem was solved by over 300 Dutch sixth graders. Subsequently, the strategy they used was coded based on their written work in the test booklets. Findings show the different strategies (written standard, written informal and mental) are not used equally frequent on the different problems. Although the mental strategy is used most frequently, nevertheless on all 19 problems the standard written strategy is used too. We found differences in accuracy of the different strategies: on average the written standard strategy is the most accurate, but there were differences between problems in the relative accuracies of the strategies too.

**Predicting students’ mathematical strategy use from teachers’ self-reports of instructional practice**

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What can we learn from secondary analyses of large-scale assessments about which educational practices promote the quality of children’s mathematics learning? Recent reviews of the effects of educational interventions have suggested that the key to better mathematical achievement appears to lie not in the formal curriculum, such as the mathematics textbooks that are used, but rather in the daily practice of interaction between teachers and students in the mathematics lesson. On the 2011 national assessment of Dutch sixth graders’ mathematical abilities, the 107 teachers of the 1619 participating students reported on the instructional practice in their classrooms. They reported on topics such as mathematical strategy instruction, work forms chosen in mathematics lessons and differentiation based on students’ mathematical ability. From these instructional practice variables, students’ mathematical strategy use on multidigit multiplication and division problems was predicted. Strategy use was coded based on the calculations that students wrote down during the assessment. Several distinct student strategy choice profiles were found using multilevel latent class analysis, which reflected preferences for answering without written working, for applying one or two types of algorithms and for non-algorithmic written strategies. Students’ probability of having a given strategy choice profile was found to be related to several aspects of instructional practice. We conclude that naturally occurring variations in teachers’ instructional practice are significantly associated with the mathematical strategies that their students use. This suggests that changes in instructional practice that are relatively easy to realize may contribute to students making better mathematical strategy choices.

University students’ understanding of research and research methods

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Finland

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Australia

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The aims of this symposium involving researchers from Finland, Denmark, Canada, the UK and Australia are to provide insights into the various understandings that graduate research students (Masters and Doctorate) have of research and research methods and how supervisors might assist in the development of these understandings. The significance of this research comes from earlier work by Kiley (2009), Meyer, Shanahan et al. (2005) and Murtonen & Lehtinen (2005) which suggested that a particular difficulty encountered by students learning to be researchers was their lack of, or

University Masters students’ understanding of the basic research methodological concepts ‘empirical’

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A concept map technique was used to investigate how university students understand basic methodological concepts in relation to each other. Students were instructed to use certain concepts in their maps (namely, empirical, theoretical, qualitative, quantitative, testing of hypothesis and analysing of data), and the false or missing relations were counted as a weak understanding of the subject. At the beginning of the course (N=28), 75%, and at the end of the course (N=17), 53% of the maps were classified as problematic concept maps. The problematic maps were further classified as undeveloped maps, fuzzy maps or maps with misconceptions. The results showed that many students had difficulties in understanding the relationships of these basic concepts. For example, qualitative research was classified as theoretical and not empirical ‘because it creates theory’. Some students thought quantitative research is theoretical, because it ‘tests theory’. Qualitative research was sometimes seen as empirical, because it is ‘related to real peoples’ thoughts’ and quantitative as theoretical, because it is ‘only a theory’. These misconceptions indicate a severe lack of understanding of these basic research concepts. Over half of the students in this study had misconceptions at the end of the course, even after many years of education and several methodology courses taken.

Science doctoral students’ learning of research methods through research work and engagement

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This study examined informal learning of research methods skills and knowledge in six science doctoral students at two Canadian universities over two years. Data collected annually for each participant included: a demographic questionnaire, 3-5 activity logs of a given week, a pre-interview questionnaire and an interview. A workplace learning perspective was used to examine each of the cases to understand how individuals’ agency and attributes interacted with a context’s affordances and opportunities for learning (e.g., supervisor, peers, books) to contribute to varying learning outcomes. It was found that students typically learned certain research methods skills and/or knowledge to a level of competence based on their need to address specific research problems or tasks, and it was difficult for them to learn beyond this. To support their learning, students drew on a
variety of sources which included people (e.g., supervisors, labmates) and informational resources (e.g., internet, books). Learning from people was most likely to lead to greater and more positive learning outcomes, whereas learning without useful feedback from people was more likely to lead to frustration and less positive learning outcomes. Effective learning requires time and practice, which limited available time to learn and negative affective factors (e.g., anxiety, frustration, disinterest) inhibited. This study describes and emphasizes the importance and prominence of informal learning’s role in research methods learning. Findings underscore the need to support this process through a consideration of the attributes of individuals and context, and by supporting the use and development of informational resources.

**Learning opportunities in PhD supervision - viewed through two metaphors for learning**

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Brian Grout  
University of Copenhagen  
Denmark

Camilla Osterberg Rump  
University of Copenhagen  
Denmark

The aim of this study is to shed light on learning in joint PhD supervision. We ask how doctoral candidates learn to do research, and how supervisors assist in the learning process. The study shows how learning opportunities are created in joint supervision. Through analysis of four cases of PhD supervision we identified learning opportunities by using the participation and the acquisition metaphors as lenses. The participation metaphor enabled us to characterize learning opportunities related to levels of participation, and here we used positioning theory to analyse the interaction. Learning opportunities identified through the participation metaphor are: Presenting, Dealing with clarifying questions, Engaging in dialogue, Supervisors supplementing, Direction and advice, Supervisors’ dialogue, Supervisor thinking aloud. When using the acquisition metaphor we focused on the PhD student’s engagement with the subject, i.e. ‘how to do research’. We looked for situations where variation in specific aspects of doing research was made visible. Examples of learning opportunities identified through the acquisition metaphor are variations of experimental design, limiting number of setups by defining the real variation, and variation of sampling procedures. Findings identified from these two lenses were compared to look for any pattern in prevalence. Preliminary results indicate that engagement in dialogue can support effective learning by making variation visible.

**What is research?**

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CHELT  
Australia

The aim of this research was to identify through regular meetings with doctoral candidates what it was about the concept of research that they found particularly difficult or challenging in learning to be a researcher. Furthermore, by working in groups over several months, a second area of investigation involved asking candidates if discussing such issues regularly in small, collegial working groups helped them in their learning to be a researcher? The issue of finding the concept of research challenging had come from some earlier work involving interviews with supervisors (Kiley, 2009) and
the study being reported sought to extend the understandings by working with candidates. Two main findings came from the study, one related to candidates difficulty with the concept of research and how the concept challenged their thinking. The second major finding related to the group discussions which were reported to having assisted them in learning not just the concept but about themselves as a researcher.

Exploring Scientific Reasoning in Primary Classrooms: a Cross-national Study

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David Clarke  
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Australia

This symposium is situated in the ‘EQUALPRIME’ project: ‘Exploring quality primary education in different cultures: A cross-national study of teaching and learning in primary science classroom’, which uses contemporary video capture and data analysis technology to study primary science classrooms in Australia, Taiwan and Germany. This project explores teaching and learning practices that create opportunities for quality reasoning and sustainable learning in science against a backdrop of diverse cultural traditions and teacher beliefs. Within the project there are two significant problematic constructs that have occupied the team’s mind in coming to data collection and analysis, that of culture as an explanatory construct to make sense of the diverse classroom interactions we are identifying, and that of reasoning, which applies both to student performance and to teacher orchestration of diverse symbolic and material tools, and which has a varied history of characterization in the literature. This symposium will present video and other classroom related data to analyze the reasoned interactions occurring in classrooms in these three countries, through a variety of theoretical lenses. The aim of the symposium is to open up the questions: How might we characterize scientific reasoning in its different forms? How might we effectively analyze interactions in these diverse classrooms that support quality reasoning and learning? How might we look for evidence of this reasoning and learning and relate these to the project’s focus on investigating the way this reasoning is practiced in classrooms in different cultures?

Teacher support of reasoning in primary science – a cross-cultural comparison

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Germany

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Gisela Romain
A major aim of education is the support of higher order thinking. This paper presents analyses of teacher discursive moves in supporting student reasoning in primary school science, in quality classrooms in Australia, Germany and Taiwan. Discursive analyses of video of classroom sequences showed the complex ways in which knowledge was transacted, with students being supported to generate and justify ideas in all cases, but in different ways. The analyses revealed a commonality in the non-evaluative discursive moves of the teachers, but with very different patterns of control of talk, of negotiation of knowledge, of teacher re-voicing and response to student claims, and of representational negotiation. Comparison with a further Australian teacher is used to explore the extent to which these differences are cultural in nature, or relate to natural variation in teacher beliefs and practice. We argue on the basis of the analysis that while student reasoning, and support for reasoning, can take many forms, some of them cultural in nature, quality teaching has certain identifiable characteristics that transcend national boundaries.

**Student-teacher interactions supporting reasoning in Taiwanese science elementary classrooms**

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To understand better how and why student-teacher interactions supporting scientific reasoning in Taiwanese classrooms are so different from interactions in Australian and German classrooms observed in this tri-national study, this paper goes beyond the observable patterns of instructions and interactions in Taiwanese science classrooms to explore the embedded cultural attributes behind Taiwanese teachers’ pedagogical practices. The authors identify areas of divergence between teachers’ beliefs in science teaching, pedagogical practices and Taiwan’s educational norms, and examine types of student-teacher interactions that are socially constructed and culturally framed. Since classroom teaching and learning culture often imposes itself upon teachers and learners, shaping attitudes to the discipline, teacher-student dynamics, and pedagogical practices, it is expected that the analysis of the cultural attributes embedded in teachers’ pedagogical practice will not only contribute to a better understanding of the patterns of classroom interaction but also yield
important information about why classroom experiences are as they are and provide a platform for considering system reform or pedagogical change in science education.

An Australian case study of multimodal representations and reasoning in primary science

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There is increasing recognition of the role of multimodal representation in developing children’s scientific literacy and reasoning skills. The study reported in this paper is framed from a socio-cultural and social semiotic perspective and investigated reasoning and multimodal representation in an Australian year 4 primary science classroom. Video capture and ethnographic methods were used to study how a teacher and her students drew on multimodal resources to scaffold scientific reasoning and explanation. A vignette of classroom action is presented here to explore and illustrate the effect of manipulating materials on children’s reasoning and construction of scientific literacy. Evidence from this case study suggests that when learning science children use the full range of material and bodily resources available to them to make and express meaning. Furthermore, that object manipulation and gesturing in a multimodal environment complements and in some cases compensates for children’s developing scientific vocabulary and syntax for constructing verbal reasoning and explanations. It is proposed that taking a distributed view of cognition could invite a more inclusive and expanded view of scientific reasoning and the role of multimodal representation in primary science.

Quality teaching and reasoning in primary science classrooms: Characterising difference

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The aim of the international research study occurring across Australia, Taiwan and Germany is to identify what quality teaching and learning looks like in grade 4 science classrooms. This paper focuses on identifying core elements of quality teaching and learning, especially reasoning, in four cases, two from Australia, one from Germany and one from Taiwan. The analysis focuses on selected science lessons from teaching sequences, drawing on a video record from a whole unit, teacher and student interview data, lesson plans and student artefacts for each case. The cases include two specialist science teachers and three generalist primary teachers. By examining the commonalities and differences in the teaching practice identified as ‘quality’ across a range of settings, the core elements as well as the variability in what we might characterize as quality can be investigated. These core elements included the engagement of children in science with innovative hands-on activities; inquiry approaches, and active communication with a range of discursive strategies, including gesturing and the use of representations to promote scientific understanding. Variation was observed around the expression of these core characteristics for different teachers and different cultures. Thinking behaviours such as reasoning, problem solving, respectful interactions and collaborations in the classroom were expressed differently for different teachers and different cultures. In the analysis, the characterization of difference across teachers and across cultures became central to the task of identifying the core elements of quality teaching.

Social and Interactive Aspects of Learning and Instruction

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There has been a rapid growth in the use of small groups in teaching and technology supported learning environments to engage students in active learning (Decuyper, Dochy, & Van den Bossche, 2010; Michaelsen, Knight, & Fink, 2002). The introduction of teams as basic learning units in the classroom redefines the classroom as learning space; a space in which the different agents in the learning process, teachers, teams and students - are together. Literature has recently pointed out that in addition to engaging in internal learning activities, teams must engage in external, cross-boundary spanning learning activities (Bresman, 2010; Hernandez Nanclares, Rienties, & Van den Bossche, 2012). Hernandez-Nanclares et al. (2012) refer to cross-boundary activities between learners and teams as knowledge spillovers, or ‘the positive influence that teams receive in terms of knowledge from other teams in the classroom’. Using an innovative dynamic Social Network Analysis approach, this symposium tries to assess the conditions in which teams learn from the experiences of other teams in their class through their academic and social relationships within the networks and what the underlying mechanisms for creating these learning spaces are. By comparing four different settings and methods in UK, Spain, Finland and the Netherlands, the analysis of the relation between social network relationships and knowledge spillovers can provide insights into the boundary conditions under which these knowledge spillovers occur. These insights can subsequently be utilized.
in the design of learning environments and for implementing structures that help to install these boundary conditions in educational institutions.

**Knowledge spillovers in active team learning: transfer of learning between teams**

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Most research on team-learning focuses on learning within teams. However, to what extent do learners also share knowledge between teams during a course? This is the central aim of this paper: analyse and measure the possible learning spillovers between learners and teams over time. In this study we want to know if knowledge is really transferred among learners and how this transfer occurs inside and between teams. This study took place in a third-year course on International economics in a Spanish University, whereby 57 students were divided into eleven teams and learned and collaborated in an innovative blended learning environment. To capture whether inter- and intra-team learning and knowledge spillovers occurred during the course, we used dynamic Social Network Analyses (SNA). We measured prior friendship relations during the first week, while possible knowledge spillovers between learners and teams were assessed during week 4, week 7 and week 14. The results indicate that all eleven teams developed outside links to other teams after 14 weeks. Already after seven weeks, the average number of external links tripled to 20.0 (9.4). Finally, after 14 weeks the average number of external links was 18.4 (7.6) implying that in comparison to the beginning of the course learning occurs both within teams as well as outside teams. Our results indicate that pre-existing friendships play a part in knowledge spillovers, but dynamics between learners and teams over time seem more important.

**The impact of mixing students from different social networks on knowledge spillovers**

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Recent literature indicates that teachers can improve group dynamics by allowing students to self-select members of their group. However, an obvious risk of allowing students to self-select their group members is cronyism. In this paper, students from different parts of their initial friendship social network were mixed, as it was hypothesised that heterogeneous teams would keep both internal and external ties, thereby leading to more knowledge spillovers over time. Using a mixed-method of dynamic social network analysis of 81 third year undergraduate hospitality students and follow-up semi-structured interviews with six students, the results indicate that students initially had very strong friendship and learning networks. As a result of mixing the students from various parts of the network, initially most students (previously) learned more from students outside the group. After
eleven weeks, students developed significantly more friendship relations within the group and the E-I index of learning dropped significantly, indicating that students developed a more internal focus over time. Follow-up MRQAP indicated that learning after 11 weeks was primarily predicted by the group division, followed by the initial learning network. The qualitative interviews indicated that students who were more open to sharing knowledge (and had strong intercultural backgrounds) were able to act as linking pins in the network. The results indicate that teachers can improve group dynamics by pro-actively arranging groups based upon SNA methods.

A 18 month longitudinal analysis of knowledge spillovers in PBL

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Collaborative learning is widely acknowledged to facilitate student learning. Besides formal collaborative interaction, informal interaction among students is suggested to be a key element of student learning. This study explores the dynamics of informal student learning over time. More and more studies show the importance of not only intra-team collaboration, but also inter-team relationships or knowledge spillovers. As students learn how to learn, we hypothesized that students would become more externally oriented learners when advancing through the curriculum. A longitudinal social network analysis was conducted four times during 18 months amongst 322 undergraduate medical students involved in a Problem-Based Learning curriculum, observed. The E/I index indicates the interteam-relationships or ‘knowledge spillovers’. Graphical analyses showed that the students’ informal interactions were mainly based on intra-team relationships within their first tutorial group. In contrast, E/I indexes of these students showed that later in the curriculum, students were progressively interacting more intensively with students from other tutorial groups (inter-team contacts). This study provides a comprehensive longitudinal understanding of (informal) learning processes. More research is needed with a focus on the contents of the interaction between students and the relationships and analyses of the effects of knowledge spillovers over time.

Indicators for knowledge brokers and spillovers?

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The concepts of boundary spanners or knowledge brokers indicate increasing interest for participation and collaboration across groups, sites, institutions, and organisations. The aim is to find indicators for knowledge spillover. How is it possible to distinguish important knowledge brokers or spillover sources among learners? The example uses data from a company but the methods apply to any learning context. The online questionnaire was sent to all workers (N=89) and the response rate was 91%. The workers were asked to mark on the list of names the colleagues with whom they collaborate and from whom they ask for advice. Several measures for knowledge brokering or cognitive centrality were used to distinguish the cognitively central workers in the company. According to the social network analysis, the workers collaborate at least ‘sometimes’ at 89% density
level, and ‘repeatedly’ at 14% density. Brokering is crucial in the environments where the density values are lower and not everyone is in contact with all. The brokering measures indicate different aspects of knowledge exchange. The centrality measures and personal network’s size indicate who is influential and has overall wide resources whereas the density value of alter network indicates those actors that mediate non-redundant knowledge. Gould & Fernandez measures show the brokering profiles between groups. However, the most interesting view to knowledge brokering seems to be found along stochastic tools, which is based on structural equivalence approach. The contribution of the paper for learning research is to better understand the structure of the communities of learners and experts.

**Morality, Religion and Education**

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Wiel Veugelers  
University of Amsterdam / University of Humanistic Studies  
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Marina Santi  
University of Padua  
Italy

Philosophy for children is a well known educational program that is used in many countries. The program is based on the work of Lipman and others and focuses on developing skills for critical thinking and philosophy to analyze topics that are important for children’s personal life and for living in society. Recently in some Western European countries philosophy for children or sometimes called philosophy with children has been linked to citizenship education. Citizenship education aims to enlarge the orientation of students to social life and society, now as children and as future citizens. Philosophy for children can be a valuable element of citizenship education. In several countries researchers have developed initiatives to link in theory and in practice philosophy for children with citizenship education. Till now, not so much empirical research has been done in the field of philosophy with children. In this symposium we present three empirical studies. These studies focuses teaching and learning processes and on the implementation, the practice and the effects of the programmes. The papers are:‘Fostering citizenship in marginalized children through participation in Community of Philosophical Inquiry’ Claire Cassidy and Donald Christie, University of Strathclyde, Glasgow.‘Philosophy for Children as Citizens: An Enhancing Curriculum To Learn Democratic Thinking.’ Marina Santi and Diego di Masi Diego, University of Padova, Italy.‘Philosophy for democracy’. Rob Bartels, Jeroen Onstenk and Wiel Veigeler, Inholland University of Applied Sciences, Alkmaar/Haarlem, the Netherlands. The symposium will start by an Introduction: Linking Philosophy with Children and Citizenship Education. Wiel Veugelers, University of Humanistic Studies / University of Amsterdam.

**Community of Philosophical Inquiry and citizenship with marginalised children**

Claire Cassidy  
University of Strathclyde  
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Donald Christie  
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This paper presents a series of case studies in a range of Scottish educational settings of children who might be considered to be socially marginalised, including children with Autistic Spectrum Disorders and children who because of significant social disadvantage are looked after in residential care settings. These children were involved in an extended study of the potential value of participation in practical philosophy in the form of Community of Philosophical Inquiry (CoPI). The Curriculum for Excellence for all children in Scotland aged 3 to 18 has ‘Responsible Citizens’ and ‘Effective Contributors’ as two of the four ‘Capacities’ identified as the key outcomes of the curriculum (Scottish Executive, 2004). CoPI has certain features and qualities that would appear to create conducive conditions for the achievement of these broad goals. The present study investigates the ways in which marginalised children engage with CoPI and attempts to evaluate the impact of participation in such learning activity on key aspects of citizenship education, including children’s dialogical skills, critical thinking and reason giving. From careful analysis of recorded CoPI sessions, the level and quality of engagement of each of the case study children was assessed and this was related to other available information in order to ascertain the ways in which an approach such as CoPI might empower socially marginalised children. The analysis would support the hypothesis that in addition to benefiting from being provided with what Wegerif (2011) has described as ‘dialogic space’, marginalised children appear to benefit from the structure that is inherent in the practice of CoPI.

Philosophy for Children as Citizens: An Enhancing Curriculum To Learn Democratic Thinking

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Democratic education turns around the development of those thinking capabilities (Sen, 1998; Nussbaum, 2010) that enable such opportunity and experience of deliberation. In this approach democratic education means, first of all, to support participation environments to acquire and exercise ‘Complex Thinking’ (Lipman, 2003). This kind of thinking is substantiated into reasoning skills and attitudes (Santi 2006, 2012), such as argumentation, reflection, evaluation, choice, which are based on critical, creative and caring dimensions of thought and agency (Di Masi & Santi, 2011, 2012). All the research project is guided by the hypothesis already tested (Santi, 2007; Di Masi, 2012) that the dialogical-reflective activities in ‘community of philosophical inquiry’ as proposed by Philosophy for Children (P4C) programme improves the appropriation of the procedural citizenship’s skills (Audigier, 2005) crucial for children well-being and well-becoming. In particular in the Polisophia educational proposal (Santi & Di Masi, 2010, Di Masi & Santi, 2012) the experiences of Municipal Councils of Children (MCC) are considered as opportunities for children choice and deliberation on their own life, conjugating with the P4C tradition and its world-wide scientific results. The focus of this presentation is that to highlight how P4C becomes a privileged example of Enhancing Curriculum, in which the features of a ‘real curriculum’ as identified by Curriculum Transposition (Di Masi & Santi, in press), meets the aims of a flourishing-based Educational System instead that only achievement-based one.

Philosophy for Democracy

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Philosophy with children seeks i.a. to develop children’s critical thinking, their judiciousness and also aims to enhance their dialogical skills and attitudes and to contribute to their dealing with differences. These are important competencies for a citizen in a democratic society. In this research project ‘Philosophy for Democracy’ these aims have been explored in four Dutch primary schools: which contribution does Philosophy with Children make to the development of democratic skills and attitudes? The research outline was based on Goodlad’s curriculum model which was further developed by Van den Akker. In this model, a curriculum is divided into six levels: the underlying view or rationale; manuals and other resources; the interpretation by the teacher; the operationalisation of teachers and children in their classes; the experiences of the children and the results of the curriculum. At each of these levels we have examined Philosophy with Children in relation to democratic education. The main findings of the study show that Philosophy with Children in the research schools contributes to the development of dialogical skills and attitudes of children, as well as their appreciation of differences, and their ability to deal with those in a positive way. With regard to the contribution that it makes to the development of children’s thinking and judiciousness the results in this study are less convincing.

Citizenship education and possibilities for Philosophy for Children

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Philosophy for children is a well known educational program that is used in many countries. The program is based on the work of Lipman and others and focuses on developing skills for critical thinking and philosophy to analyze topics that are important for children’s personal life and for living in society. Recently in some Western European countries philosophy for children or sometimes called philosophy with children has been linked to citizenship education. In many Western countries citizenship education has been introduced in education to enlarge the orientation of students to social life and society, now as children and as future citizens. According to some scholars philosophy for children can be a valuable element of citizenship education. In several countries researchers involved in philosophy for children have developed initiatives to link in theory and in practice philosophy for children with citizenship education. Till now, not so much empirical research has been done in the field of philosophy with children. In this symposium we present three empirical studies. These studies focuses teaching and learning processes and on the implementation, the practice and the effects of the programmes.
This symposium examines the role of social networks in professionals’ learning and expertise development. The importance of the social dimension of learning, in particular of learning from the experience of others, has been increasingly recognised in the literature. For example, the concept of ‘networked expertise’ (Hakkarainen et al, 2008) has been put forward to characterise learning and development in professional contexts. Despite the growing recognition of the importance of networks in learning, it is not well understood what precisely is learned through networks, what kinds of knowledge, skills or dispositions, and how it is learned. Investigations of the factors and mechanics of learning and expertise development through networks is vital to our understanding of the contemporary professional learning. An EARLI symposium capturing current empirical research in this area is timely. This symposium brings together contributions from leading European researchers conducting interesting and important theoretical and methodological work in the emergent domain of Learning through Networks (LTN). Contextualised in different settings and using complementary methodological approaches, the symposium contributions collectively address the following overarching questions: 1. What is the potential of applying a social network perspective to understanding the nature of learning through networks? 2. What are the patterns of learning through networks? 3. What key factors impact learning through networks? 4. What is the role of trust in LTN and how do individuals make decisions about others’ trustworthiness when learning through networks? The symposium formulates an agenda to stimulate future research in this area.


Exploring academics’ learning spaces: An ego-centric network approach to learning about teaching

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The overarching objective of the study is to investigate how networks support academics’ professional learning and enhancement of practice. Academics’ learning in personal networks is investigated through a combination of social network analysis and qualitative interviews. Thirty seven academics from ten universities participated in this study. The analysis of the composition of academics’ learning networks reveals an overreliance on physically proximate (institutionally-localised) and strong-tie connections. Such network structure suggests academics’ limited exposure to new ideas, new insights and innovations related to teaching and also restrained opportunities to leverage resources and knowledge available elsewhere. Participants’ personal networks primarily
facilitate the acquisition of ‘know what’ and ‘know how’ knowledge and provide professional support to overcome teaching-related difficulties. This study contributes to extending our understanding of the processes of learning through networks from a social network perspective.

The Importance of Know-how in Becoming an Expert Teacher in Higher Education

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This study investigated the role of teachers’ educational networks (‘know-who’) in the development of their individual expertise. We carried out an exploratory study using a mixed-method approach. To capture teachers’ educational networks, we applied ego network analysis. 30 teachers were interviewed using network maps. Respondents were pre-selected on the basis of their level of teaching expertise and teaching experience in order to discern and compare three groups: novice teachers, experienced teachers and expert teachers. Results based on multilevel analyses indicate that expert teachers show more variation in their educational network and that they communicate with more people about their instructional practice. This suggests that the network characteristics of expert teachers open up more opportunities to learn from the experiences of others. These results demonstrate the potential value of applying a social network perspective on examining factors underpinning the development of teachers’ expertise in higher education.

Do professionals’ personal networks grow during the energy efficiency training and how?

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The purpose of this investigation was to examine the development of personal learning networks that were created during a year-long academic apprenticeship type of training in the field of energy efficiency (EE). Personal networks are rich repositories of professional knowing and a valuable outcome of professional training. The EE training was jointly organized by three universities, two of which organized education for actors in the public sector and one for actors in the private sector. 87 participants took part in the training. By administering an online social networking questionnaire at the beginning and the end of the course, we examined the development of the six most central participants’ personal networks. By interviewing participants we analysed factors in achieving the central position among other course participants. The results indicated that the cognitively central
participants had versatile work experience and were interested in pursuing careers in the field. Neither age, gender, nor prior education had any influence on the results. Instead, the level of previous EE expertise, personal characteristics, and the nature of their employing organization appeared to be important. The change in the personal networks for all participants, on average, was tiny.

**Networked learning for professionals**

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Networked learning utilises the affordances that the Internet provides to foster learning. Much work has been done in the context of formal, school-based learning (cf. series of Networked Learning Conferences: www.networkedlearningconference.org.uk), but the opportunities for professional learning are only beginning to emerge. The emphasis there is not on formal bouts of training by expert teachers, but on the ability to learn informally, on sharing and creating knowledge while working on the complex and authentic problems that arise in the work context. How does one support such informal learning by professionals, is the key question here. An elaborated instructional design with carefully arranged tasks of increasing complexity, accompanied by bits of information that are made available just in time, won’t do, simply because the problems that the design is supposed to address are not known yet. So, no design instances can be created. Conversely, a ‘design’ that leaves professionals to their own devices is possible, but would fly in the face of any serious designer, whose efforts should consist in making learning more productive. This contribution discusses aspects of peer collaboration, as a means of flexibly and adequately improving the efficiency and effectiveness of knowledge sharing and knowledge creation by networked professionals.

**Learning Outcomes in Higher Education – surveys, trends and research desiderata**

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The first results of PISA-study draw attention to the quality and outcomes of education. As a consequence of it, competences are described graduates should be able to apply. So far, it has been focused on input, which should be taught. Furthermore, cognitive skills are no longer sufficient, generic skills are emphasized as learning outcomes as well. While research in schools is very well developed, higher education research about learning outcomes of higher education is still in the beginning. Experiences and findings of school-based research cannot be transferred that easy onto higher education: other areas of competences as well as different levels of competences are
prevalent; organization and process of education are limited comparable. Recognizing this, some influencing surveys have been established: the Assessment of Higher Education Learning Outcomes (AHELO), The National Educational Panel in Germany (NEPS), the Teacher Education and Development Study in Mathematics: Learning to Teach Mathematics (TEDS-M). These surveys aim to measure outcomes of higher education. A Dutch project aims to address the question what area of competences should be learned. This symposium will bring together this international trend to develop measurements and standards of competences in higher education. We expect also to identify further lacks, like more theory-driven research and further longitudinal studies. Therefore, we hope to give incentives for higher education research.

The German National Education Panel Study (NEPS): Assessing Competencies in Higher Education

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Apart from other developments the Bologna process and the European Qualification Framework resulted in a growing interest in competencies acquired through higher education. But while competence modelling and assessment have become common in school education, they are rare in higher education. And it is not until recently that several national as well as international initiatives were taken to close this gap. The German National Educational Panel Study (NEPS) is amongst these initiatives. One of the main goals of the NEPS is to systematically address the issue of competencies. To this end, the NEPS takes several competence areas into account: domain-specific cognitive competencies, e.g., mathematical literacy, which are subject-bound during school age and become basic, cross-curricular competencies in later life; meta-competencies an social competencies; and subject-specific competencies in higher education. In addition, the NEPS collects data on domain-general cognitive functions, stable personality dimensions, and motivation. Focussing on higher education, the paper will discuss how competencies are conceptualised in the NEPS, and what rationale lies behind the selection of competence areas. It will elaborate on the research potential of the NEPS data, the strengths and weaknesses of the NEPS approach, and on desiderata for future research.

Higher education outcomes: Teacher knowledge in Asia, Eastern Europe and Western countries

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The ‘Teacher Education and Development Study in Mathematics: Learning to Teach Mathematics (TEDS-M)’, carried out under the supervision of the IEA, assessed the mathematics content knowledge (MCK) and the mathematics pedagogical content knowledge (MPCK) of more than 23,000 primary and lower-secondary mathematics teachers from 16 countries at the end of their training. By detecting and explaining differential item functioning (DIF), this paper examines strengths and weaknesses in the future teachers’ MCK and MPCK. Content domains, cognitive demand and item format significantly explain variance in DIF. Teachers from Taiwan and Singapore are particularly strong on constructed-response items. Teachers from Russia and Poland are strong in non-standard operations. The USA and Norway do particularly well in MPCK. Thus, teacher knowledge matches national debates on mathematics education and the characteristics of the countries’ student achievement as known from TIMSS and PISA. The result points to cultural influences in education.
Can learning outcomes in higher education be measured internationally? AHELO as an example

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Fast growth in the number of higher education institutions and students, changes in the world of work, and greater investments in higher education globally, all add expectations for learning and learning outcomes in higher education. However, so far no reliable international data can be found on the outcomes of learning but available information consists mainly of rankings often biased towards input factors and research. International Assessment of Higher Education Learning Outcomes (AHELO) is an attempt to fill in this gap. The main aim of the study is to explore the feasibility of measuring learning outcomes in higher education across different institutions, countries, languages and cultures. The study involves 17 countries and includes generic skills and two educational fields (economics & engineering). Both constructive tasks and multiple-choice items were developed to measure learning outcomes. Preliminary results suggest that it is possible to internationally define discipline-specific learning outcomes but generics skills are more problematic in this sense. It is also viable to develop cross-national, cross-cultural and cross-linguistic test instruments, to find international consensus on contextual dimension framework and instruments as well as to engage countries and institutions to the study but motivating students is more challenging.

What Is Expected from Higher Education Graduates in the 21st Century?

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Universities have been the place where higher order knowledge and skills have been developed and nurtured. Never before, expectations towards higher education and its graduates have been so strongly expressed - in particular by employers. This paper examines the skill set graduates are expected to possess. Six trends form the basis of the changing role of graduates: the knowledge society, the ICT revolution, globalization, the change of the economic structure, high performance workplaces, and increasing uncertainty. These trends generate new and intensify traditional skill demands, which we summarize as professional expertise, innovation and knowledge management, international orientation, entrepreneurship, mobilization of human resources, and flexibility. Using this categorization as a guideline, we examine recent trends in skill requirements and skill mismatches among graduates of Dutch universities of applied sciences (hogescholen). We begin by examining whether there are indications as to whether the demand for the abovementioned skills is indeed increasing under influence of the six trends, and if so whether this has given rise to increases in the incidence of shortages of those skills, and whether the returns to these skills is also changing. We also look for indications of whether the manner in which the skills are applied is subject to change, for example in the types of organizations in which they are typically applied or in the specific skill constellations in which they are required.

Approaches to initiate and support learning by comparing and contrasting cases

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When cases have to be compared or contrasted, structural alignment processes are triggered which promote learning by abstraction, inference-projection and difference detection. Research has shown that these processes facilitate transfer of knowledge about principles and help learners to distinguish related and therefore easy to confuse principles. However, triggering these processes by simply presenting several cases is not sufficient. Learners have to actively engage in the comparison or the contrast and this needs initiation and support by instructional prompts. To date, the specific effects of different instructional prompts have received surprisingly little attention in the comparing and contrasting cases literature. In this symposium, four studies will address this question. Ziegler and Stern initiate and support learning by contrasting cases via direct instruction at the blackboard. Glogger et al. demonstrate that contrasting cases with solutions (i.e. worked-examples) is more effective than contrasting cases for which learners have to invent solutions. Schalk et al. compare combinations of different representations of cases and support techniques to assess specific advantages or disadvantages for transfer performance. In a collaborative learning setting, Loibl and Rummel show that problem-solving can more effectively be complemented with instruction based on comparing and contrasting typical student solutions than with instruction based on canonical solutions. In a nutshell, the studies provide convincing evidence that comparing and contrasting cases is a promising strategy to enhance both acquisition and transfer of conceptual knowledge if accompanied by prompts that guide students attention to the relevant aspects of the cases.

**Consistent advantages of contrasted mathematical concept learning**

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Comparisons are acknowledged as effective principles for concept learning. Many studies have investigated the effects of comparisons in self-learning settings. However, direct instruction is still the most widespread and common instruction method. Thus, we adapted self-learning materials of a former experiment that showed benefits of the contrasted introduction of algebraic additions and multiplications for a direct instruction at the blackboard. A total of 87 sixth-graders participated and were randomly assigned to one of the two groups: (1) in the contrast group, algebraic addition and multiplication were introduced simultaneously at the left and right blackboard by always comparing them, (2) in the sequential group, students practiced addition examples for two days, followed by two days of multiplication training. The two programs had an identical structure, but differed in the presentation order of the worked examples and trial tasks. We clearly replicated our prior findings that contrasting is an effective method for algebraic concept learning. Students who had undergone the contrasting program clearly performed better in differentiating the superficially similar algebraic concepts than students who were introduced in algebraic addition and multiplication one after the other. Previous research has demonstrated the benefit of contrasting in self-learning settings. Our
results extend the applicability of contrasting for the common instruction method of direct instruction. Having demonstrated in a former and the present studies that contrasting is more effective, even though it is more demanding in the short run, can make scientists confident to recommend a contrasted introduction of algebra in secondary school.

**Problem-solving only prepares for learning if student ideas are contrasted to the canonical solution**

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Multiple studies have shown benefits of problem-solving prior to instruction. These studies usually compare problem-solving prior to instruction to instruction prior to problem-solving. Problem-solving prior to instruction prompts students to activate their prior knowledge. During subsequent instruction the solutions that students have generated during problem-solving can be compared and contrasted to the canonical solution. This comparison may guide students attention to the relevant aspects of the canonical solution. So far, it is unclear whether the benefits of problem-solving prior to instruction are based on the activation of prior knowledge due to the delay of instruction or whether the benefits originate from comparing and contrasting students’ solutions to the canonical one. To separate the effects of the sequence of problem-solving and instruction, and of comparing and contrasting student solutions during instruction, we conducted a quasi-experimental study with 247 high school students varying the two factors timing of instruction (problem-solving prior to instruction versus instruction prior to problem-solving) and form of instruction (standard instruction focusing on the canonical solution versus instruction that compares and contrasts typical student solutions to the canonical solution). Our results indicate that the process of comparing and contrasting typical student solutions during instruction is a prerequisite for the effectiveness of problem-solving prior to instruction: Problem-solving prior to instruction combined with subsequent instruction where student solutions were compared and contrasted to the canonical solution outperformed all other conditions on items testing for conceptual knowledge. Problem-solving prior to standard instruction was no more effective than standard instruction prior to problem-solving.

**Contrasting cases with and without inventing: A process analysis**

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Inventing a problem-solution with contrasting cases aims to prepare learners for subsequent direct instruction. This preparation activity activates prior knowledge which, in turn, can facilitate later knowledge acquisition (cognitive effects). It can also make the learner more interested in the learning contents (motivational effects). Activities such as inventing have been shown to be effective even though invented solutions are often suboptimal. However, working on the same problem with a given (optimal) solution may induce more germane load and may help avoid misconceptions. At the same time, it provides useful basic knowledge which might enhance self-efficacy. In a previous experiment, we found that inventing prepared learning cognitively and motivationally, but a worked example was superior in enhancing learning outcomes. Hence, in the present experiment (N = 36), we aimed to replicate these effects and analyze potentially differing learning processes between inventing and worked example. The inventing group invented criteria to assess learning strategies while the worked example group studied the same problem with the solution provided. Afterwards, participants thought aloud during learning in a computer-based learning environment. We found no motivational differences, but the worked examples were superior in enhancing learning outcomes. Processes during learning differed as well. The example group showed more cognitive strategies, more spontaneous application of the canonical solution, and it focused more on the most relevant learning contents. Results implicate that studying contrasting cases along with inventing a problem-solution is not more effective for preparing learning from direct instruction than a worked-out solution.

Comparing cases: How to combine concrete or idealized cases with different activities?

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Learning a novel principle by comparing cases is a promising mean to support knowledge transfer. However, this advantage does not merely result from simultaneously presenting cases. The integration of cases has to be supported by prompting specific activities of the learner and it also depends on the representation of the cases. In this study, we investigated which representations of cases (concrete or idealized) and what kinds of activity (self-explanation or invention prompts) should be combined to design learning materials. We present preliminary data, as data collection is still ongoing, for 56 eight-graders who learned to define the slope of linear functions by comparing cases. In the learning materials, we systematically varied the two kinds of representations of cases and the two kinds of activities. Results indicate that idealized cases paired with self-explanation prompts resulted in the worst transfer performance. All other combinations performed about equally well on a transfer test and this transfer performance remained stable over four weeks.

Comprehending and evaluating expository texts with contradictions

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The goal of this symposium is to synthesize research that illustrates how readers handle the complex task of forming a coherent mental representation out of contradictory expository texts. In so doing, the contributors acknowledge that expository texts can be contradictory in several ways. First, a single expository text can contain contradictions that a reader needs to detect to achieve a deeper understanding. Second, when reading more than one expository text, claims from multiple sources might contradict each other. This requires a reader to identify the conflicting status of the claims to acquire a well-integrated representation of all texts. Third, information provided in an expository text can contradict a reader’s prior knowledge. In this case, readers need to change the current status of their knowledge to resolve the contradiction. In this regard, Wittwer and Ihme examine whether contradictions in scientific explanations affect evaluation and comprehension as a function of the order and the structure in which the scientific explanations are presented. Stadtler et al. empirically test the effectiveness of a tool for identifying contradictory knowledge claims in multiple expository texts. de Pereyra et al. investigate whether information that is contradictory to what a reader knows but might be in line with the expertise of the source influences evaluation and memory. Finally, Kendeou et al. study whether the way in which contradictions between scientifically correct knowledge presented in a text and a reader’s prior knowledge are justified has an impact on learning. Richter will discuss all contributions of this symposium.

Effects of presentation order and text structure in processing inconsistent explanations

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When readers search the Internet for information that helps them to understand a scientific phenomenon, they are often confronted with explanations that compete with each other. Therefore, readers have to evaluate the quality of the competing explanations in order to come to a decision which explanation best explains the scientific phenomenon. In this study, N = 51 participants read competing explanations for different scientific phenomena. We were interested in the effects of consistency, presentation order, and text structure on evaluating and comprehending competing explanations. The results showed that readers evaluated the quality of consistent explanations (i.e., without contradictions) higher than the quality of inconsistent explanations (i.e., with contradictions). At the same time, readers evaluated the quality of firstly presented explanations higher than the quality of secondly presented explanations, irrespective of the consistency of explanations. Whether or not explanations were structured (i.e., contained subheadings) did not differently influence the quality of the explanations. However, we found that inconsistent explanations resulted in poorer comprehension than consistent explanations while the order of presentation did not differently affect comprehension. The findings suggest that although readers
are in general able to detect inconsistencies in scientific explanations their evaluation is systematically biased by the order in which explanations are presented. At the same time, readers’ evaluation processes do not completely mirror their comprehension processes.

**Prompting adult readers to monitor for consistency enhances their awareness of scientific conflicts**

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An important facet of understanding science online pertains to becoming aware of conflicting knowledge claims. Research, however, reveals that without external assistance, conflict detection rates are often mediocre when readers access unfamiliar scientific topics. Hence, the goal of this study was to empirically examine a computer-based intervention (met.a.ware) fostering lay readers’ awareness of conflicts in science texts. It was expected that receiving prompts to monitor for information consistency in medical texts would increase readers’ awareness of conflicting information. A total of 43 medical laypersons either participated in the prompting-group or a no-prompting control condition. Prompts were provided while participants read a set of medical web pages containing conflicts between factual knowledge claims. Results reveal beneficial effects of the prompting procedure in terms of memory for conflicting information and its application in a social knowledge building task. In addition, better general reading ability was associated with better performance on the dependent measures. Results are discussed in terms of their theoretical significance and educational implications.

**I can’t believe this! Plausibility and source competence in the comprehension of news stories**

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We examined the effects of story plausibility and source competence on readers’ evaluation of and memory for source information. Our assumption was based on Braasch et al.’s (2012) finding that textual discrepancies promote readers’ processing and memory for source information. We expected
the same to occur for implausible information, that is, information that would contradict the reader’s world knowledge. Undergraduate students read short stories in order to provide a recommendation regarding whether the story was credible enough to be published. After a short delay, they were asked to recall the sources of each story. We assumed that less competent sources would be more likely to be recalled especially when presented with less plausible stories. Results were being analyzed at the time of submission.

**Optimizing conditions for learning: Situating refutations in epistemic cognition**

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A refutation text is designed to promote conceptual change by explicitly acknowledging commonly held incorrect conceptions about a topic, directly refuting them, and providing a more satisfactory explanation. In the present study, we examined the impact of different types of refutation texts on adolescent readers’ conceptual change learning. Specifically, we manipulated the justification for the correct conception provided in the refutation texts following work in epistemick cognition. Three different types of justification were compared amongst them and to a control condition: Justification by authority, justification by multiple sources, and justification by personal opinion. We hypothesized that these different forms of justification could have a differential effect on student learning. The findings showed that learning effects were optimized when the correct conceptions were justified by multiple sources or justified by authority. Justification by personal opinion produced the same learning outcomes as the control texts that included no justification. Thus, textual manipulations decreasing student beliefs in personal opinion and increasing their beliefs in multiple sources or authority may be more effective ways for supporting conceptual change learning in science.

**Sustainable vocabulary development throughout the primary grades**

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Vocabulary growth is the increased representation of word meanings and their corresponding word forms. Such growth entails both more words (quantity of representations) and more refined meaning knowledge about words (quality of representations). Prior to literacy, words are acquired through speech, of course. Implicit knowledge about the sounds of words used in spoken-word recognition
may gradually evolve into knowledge about word phonology that is necessary for the acquisition of phonological awareness and literacy. With reading come opportunities to learn new word meanings and to refine word meanings through reading experience. This symposium compiles a set of four research-based papers examining the sustainable vocabulary development throughout the primary grades. The first paper goes into the role of cultural and linguistic diversity in vocabulary learning with a focus on individual variation as well as intervention effects. The second paper addresses the effects of explicit versus implicit instruction on the breadth and depth of vocabulary learning in kindergarten. The third paper examines how word learning develops incrementally, with each exposure to a word in context. Computational models are used to score partial word knowledge on each trial, and to plot word learning trajectories as a function of contextual support for learning (high, medium, low). And in the final paper, it is evidenced how the presence of orthography may enhance oral vocabulary acquisition in atypical learners. All of these papers show that sustained word learning is highly dependent on quality instruction which needs to be geared to the specific needs of the learner.

Fostering vocabulary development in young first and second language learners

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Studies, mainly focus on the kindergarten age, have show that cultural and linguistic diversity may have a great impact on early vocabulary development. It has been well documented that children from low social economic status families are at risk of delayed vocabulary development, even more so in case another language is spoken in the family as compared to the school. In order to promote early language development of children in at-risk situations during preschool, a new intervention has been developed, the so-called Language Route (‘Taallijn’). Language Route is a method that teachers can use to stimulate the oral communication and vocabulary of children in kindergarten (4-6 years of age). In the present research project, the role of sociolinguistic and educational predictive factors to toddler vocabulary were studied. Therefore, the vocabulary results of four-year-old first and second learners were related to their SES, language input en educational history. And second, the effectiveness of Language Route on vocabulary development of first and second language learning children in kindergarten was examined while following a pretest-posttest control group design in which the learning outcomes of an experimental group (working with Language Route) and a control group (working without Language Route, ‘care as usual’) were compared. Results showed that family and preschool factors have effects on toddler vocabulary. The results show an interaction effect of time (pre-during-post) by group (experimental group vs. control group). Children in the experimental group showed a larger growth in productive vocabulary than children in the control group.

Explicit and implicit instruction effects on kindergartners’ breadth and depth of vocabulary

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Sufficient vocabulary knowledge early in the educational process is one of the strongest predictors of reading success and successful learning during the educational process. Given the differences in word knowledge and its important role on reading, there is an urgent need to focus on effective early interventions to close this gap. In a pilot study we compared the effects of explicit (i.e., definitions) and implicit vocabulary instruction (i.e., storybook reading) on the vocabulary development of kindergarteners. We showed that both implicit and explicit vocabulary instruction prompted the breadth knowledge or the sheer number of words, while explicit instruction prompted the depth of vocabulary development or the meaningful relations between word knowledge. The results of this pilot study were next implemented in a classroom based intervention study. The intervention combined storybook readings and definitions, with supplementary both embedded definitions within the storybook context and extended definitions outside the context. We measured word knowledge of the children in the second year of kindergarten. Furthermore we measured individual differences and gave feedback on the word levels of the children. The results show group differences in depth of vocabulary knowledge on a standardized vocabulary test.

**A cognitive tutor for incremental and adaptive learning of words in context**

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Previous studies (Frishkoff, et al., 2011, 2010, 2008) have shown that computational methods such as MESA (Markov Estimation of Semantic Association) can be used to capture incremental gains in word knowledge over time. The present study extends this work to examine whether MESA is sufficiently robust to track these changes on a trial-by-trial basis. Participants were exposed to 45 very rare words in six different sentences (interleaved). After each sentence, participants were asked to generate the meaning (near-synonym) of the target word. MESA was used to model the response accuracy (distance from target meaning). Further, degree of contextual support (high, low, or medium) was systematically varied. Results show that MESA can be used to track incremental changes in knowledge on a trial-by-trial basis. Moreover, there were significant effects of varying contextual support for learning: learners showed different rates of learning when contextual support was faded (2 high, then 2 medium, then 2 low) than in the mixed (random ordering of high, medium, and low) and all-high conditions. Long-term outcomes (after a 1-month delay) also varied across conditions. Such dynamic assessment is critical for effective instruction because robust word learning requires multiple encounters with a word in a variety of contexts. Subsequent trials. This approach should therefore lead to instruction that is both effective (because it can lead to robust learning) and efficient (because it can be tuned to support maximal gains on each exposure).

**Do children with SLI and ASD benefit from the presence of orthography when learning new words?**

Jessie Ricketts
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Previous research has provided evidence that typically developing children are more likely to learn new oral vocabulary items when they are taught with the printed form (orthography) available (Ricketts et al., 2009; Rosenthal & Ehri, 2008). For the present study, an experiment was conducted to investigate whether the presence of orthography is associated with enhanced oral vocabulary acquisition in children with specific language impairment (SLI) and autism spectrum disorders (ASD). Children with SLI (N=28), ASD (N=28) and typically developing controls (N=28) aged 8-13 years were taught 12 nonwords. Children were trained to associate novel phonological forms with pictures of novel objects. Pictures were used as referents to represent novel word meanings. For half of the nonwords children were additionally exposed to orthography, although they were not alerted to its presence, nor were they instructed to use it. After this training phase, a nonword-picture matching post-test was used to assess learning of nonword meaning. Across all groups, new vocabulary learning was greater for nonwords that had been trained with orthography. This is consistent with theoretical accounts in which the presence of orthography is seen as facilitating oral vocabulary acquisition (Ehri & Rosenthal, 2007). The findings also have multidisciplinary implications for education and speech and language therapy by indicating that orthography should be systematically emphasised in instructional and intervention approaches aimed at building vocabulary knowledge.

**How to Deal with Fragile and Conflicting Evidence in School**

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In school, the main focus is on teaching conceptual knowledge which teachers, authors of textbooks, and curricula take as already established fact. Only on rare occasions do teachers refer to fragile and conflicting evidence. However, in preparing school students to act as ‘informed citizens’ with complex topics including fragile and conflicting evidence, it is important to include these aspects in school. From a diagnosis perspective, it is crucial to explore how teachers use evidence in instruction. From an intervention perspective, it would be helpful to construct instructional measures to support school students in processing fragile and conflicting evidence. Against this background, the aim of this symposium is to introduce assessment methods to explore how teachers use evidence (diagnosis perspective) and to analyse the effects of instructional measures to support school students in processing fragile and conflicting evidence (intervention perspective). Within this symposium, three contributions address these aims: Contribution 1 introduces situational vignettes as a valid assessment method. With respect to the intervention perspective, Contributions 2, 3, and 4 analyse the effects of instructional measures such as decision-making discussions, concept maps, and training interventions. The main findings were that (a) student teachers prefer situational vignettes with a high amount of information, and (b) that instructional measures can have positive effects on beliefs and learning outcomes. The topic of fragile and conflicting evidence in school is analysed in the DFG Special Priority Program ‘Science and the General Public: Understanding Fragile and Conflicting Scientific Evidence’. Three of the contributions are associated with this program.

**Construction of Situational Vignettes as Context for Test Tasks – a Factorial Survey**

Susanne Heininger
Situational vignettes are often used in assessment instruments to build a problem-based context. Usually information used in the vignette is intended to serve as call to action. It is, however, often unclear how the used information influences participants or rather what information participants would prefer to comply the call to action as best as possible. We implemented a factorial survey with N=38 pre-service teachers to investigate how three characteristics (perspective, initiative, amount of information) of vignettes describing school-related problems influence participant’s rating of preference. Using the full-profile method eight vignettes originated from three dimensions with two characteristics each. Results from conjoint analyses and repeated measures ANOVA show that pre-service teachers prefer situational vignettes with a high amount of information, especially in situations where people act on their own initiative and are supposed to make decisions for another person.

Improving Classroom-Based Decision-Making About Non-Communicable Diseases

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Non-communicable diseases (NCDs) account for almost two thirds of deaths globally, and yet 80% of these deaths could be prevented through changes in lifestyle. This study explores the impact of a pedagogical approach to support the development of values and skills of decision-making in relation to NCDs among 14-15 year old students. Students discussed two issues: diabetes and obesity. Qualitative pre- and post-testing of health-related attitudes, and analysis of peer-group discussion using a decision-making framework is beginning to show that the discussions help improve the quality of reasoning about NCDs, and there are early signs that girls and boys differ in their proposed solutions to the issues.

How Do Students Reconstruct the Issue of Global Climate Change

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Sabina Eggert
Georg-August-University
Germany

Matthias Nuckles
University of Freiburg
Germany

Susanne Bogeholz
Socioscientific issues (SSI), such as the issue of global climate change, represent modern science problems at the interplay between science and society. They are factually and ethically complex, have to be addressed by incorporating multiple perspectives and are often subject to ongoing inquiry. While working on SSIs students do not only need a profound scientific knowledge base, they also need to engage in various information search as well as reasoning and decision making processes. In addition, they need to be able to process information and to evaluate possible solutions to SSIs on the basis of fragile and contradictory evidence. As a consequence, working on SSIs poses high processing demands on students. The present intervention study aims to support students’ learning processes while dealing with the issue of global climate change. In particular, a computer-based learning environment with different concept mapping support measures was developed. Participants (N=84) either generated concept maps on the issue of climate change (a) from scratch, (b) from a list of provided concepts), (c) from a list of provided lines or they (d) studied in a mapping condition in which both concepts and lines were provided. Results indicate that students in the concepts-provided conditions benefit most from the given support measures. In addition, the map generation condition outperformed the training condition with most support measures.

How to Foster the Will to Engage in Argumentative Thinking

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Argumentative thinking is essential for developing well-grounded conclusions when processing conflicting scientific positions and fragile evidence as in the domain ecology and sustainability. Kuhn (2001) proposes two crucial prerequisites for the engagement in argumentative thinking: evaluatist epistemological understanding and intellectual values. Evaluatist epistemological understanding is the rational base for regarding argumentative thinking as being reasonable and intellectual values reflect the extent people regard argumentation worthwhile. Against this background we aimed to foster evaluatist epistemological understanding and intellectual values as well as conceptual knowledge through a training intervention. We tested this training intervention in a one-factorial between-subjects design comprised of two conditions: (a) Training intervention to foster the will to engage in argumentative thinking. (b) no training intervention (control condition). Participants were 68 German high school students (mean age: 17.58 years, 18 males and 50 females). Results show that a training intervention to foster the will to engage in argumentative thinking fosters intellectual values and conceptual knowledge about epistemological understanding.

Enhancing Understanding by using Mixed Methods Research

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Germany

Anthony Onwuegbuzie
Sam Houston State University
United States

Andreas Gegenfurtner
Technische Universitat Munchen
Germany

After a long period of time polarizing quantitative and qualitative methods the methodology of mixed methods research (MMR) has developed substantially. Various factors have contributed to this evolution: The complexity of research problems calls for answers that go beyond simple numbers in a quantitative sense or words in a qualitative sense. There is also a practical need to gather multiple forms of data for diverse audiences. A combination of both forms of data can provide more holistic analyses of problems and give deeper insights into the phenomenon under investigation. The rational using MMR is seen in purposes e.g., like ‘triangulation’, ‘complementarity’, ‘development’, ‘initiation’, ‘expansion’. As there is a growing interest in examining applications of mixed methods research within different disciplinary contexts - especially within educational research , the aim of this symposium is (1) to raise and discuss current developments in the field of mixed methods research. (2) to present and discuss MMR-examples highlighting specific issues of MMR-phases and (3) to discuss critically the added value of these research for educational theory building but also for practical use.

Current Developments in the Field of Mixed Methods Research

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United States
The purpose of this presentation is to provide an updated discussion of what Teddlie and Tashakkori (2010) identified as the nine important issues or controversies in contemporary mixed research: (a) conceptual stances; (b) the conceptual/methodological/methods interface; (c) the research question or research problem; (d) language; (e) design issues; (f) analysis issues; (g) issues in drawing inferences; (h) practical issues in the application (e.g., pedagogy, collaboration, and other models, funding); and (i) cross-disciplinary and cross-cultural applications. The latest developments regarding each of these issues will be outlined with the goal of critically examining the extent to which the field of mixed research has advanced in recent years.

Mixed Method Perspectives of Qualitative Content Analysis on Instruction Research

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Germany

Sascha Ziegelbauer
Friedrich Schiller University of Jena
Germany

Conducting empirical research in the field of learning and instruction is a highly complex task. It requires first, to find the most appropriate research methods to address the theoretically framed research questions. Second, those research methods and strategies need to be identified, designed, and applied to ensure that results produce reliable and valid answers to these questions. After overcoming the past methodological disputes between qualitative and quantitative research, strong arguments against that polarization have been formulated, and a continuum in making inferences with both kinds of data has been suggested. This presentation is focusing on qualitative content analysis as a specific qualitative method for analysis of social data that offers multiple possibilities for mixed method studies. Based on a research study on instruction research, the ways in which data can be analyzed and interpreted by qualitative content analysis are illustrated. The direct combination of interview, questionnaire, and videotaping data and their qualitative and quantitative analysis is illustrated. The linkages to theoretical issues, design, creating a sample, data collection and analysis within the different types of mixed method approaches are illustrated and discussed. Finally, implications for designing mixed method studies and their contribution for a better and deeper understanding of learning and instruction are discussed.

Analysis of workplace affordances and large-scale assessment – a mixed methods research approach

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Measurement of vocational and professional competencies which not only constitutes the knowledge but also includes the action domain is one of the central targets of research on professional learning and education, under scientific as well as political perspectives. As we can state the influences of so-called ‘megatrends’ on work processes we find in all industrialized countries trials to adapt the work structure as well as the processes of vocational and professional education and training to the new challenges. According to the tradition and culture of the different countries we find different patterns of formal and informal vocational and professional learning by which the
design of new formats of professional profiles and new combinations of competencies shall be supported. One major reason for this endeavour is to prepare the workforce adequately for the new demands and to avoid unemployment, especially of youth and young adults. With regard to an international comparison one has to solve at least three methodological problems: - How can the relevant structural conditions of vocational and professional education and training systems be explored and analyzed? - How can, with regard to the differences of job-classification schemas in the different countries, professional fields and work activities qualitatively be identified and compared to each other? - How can on this basis professional competencies quantitatively be measured and compared? These questions are discussed more in detail governed by major principles of mixed method research.

**Visualizing Belief Changes as Result of an Entrepreneurship Education Course – A Mixed Method Study**

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Germany

Susanne Weber  
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Germany

Governments around the world are increasingly investing in their enterprise policies in order to unlock the entrepreneurial potential of young people (Athayde, 2009). However, this widespread rise in entrepreneurship education at universities is frequently not accompanied by rigorous and sustainable program evaluations. Therefore, the effects emanating from entrepreneurship programs are still insufficiently understood (OECD, 2009). In order to enhance this understanding, we derive an ‘entrepreneurship education model’ (EEM) following Li and Chen’s (2009) modification of Ajzen’s (1991) theory of planned behavior and use it as a mixed methods evaluation tool in an awareness education setting at a large German university. Awareness education directly acts on students’ ‘personal attitude’ (PA) towards entrepreneurship as it aims at increasing the number of individuals having profound knowledge about self-employment, thus considering entrepreneurship as a viable occupational option. We find support for the proposed causal link from awareness education to students’ entrepreneurial attitudes derived in the EEM and that perceived control over entrepreneurial tasks is not a relevant predictor of start-up intentions in an awareness setting. Further, we observe two course-induced effects on students’ belief systems determining their personal attitude: the corruption effect of extrinsic motivation (Deci 1975) and a shift in locus of control (Rotter 1966). Our findings add value to the domain-specific application of the TPB and provide entrepreneurial awareness educators with orientation in making curricular and instructional decisions on their entrepreneurship course.

**Numeracy and arithmetic competence**

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Technische Universitat Munchen  
Germany

Kristina Reiss  
Technische Universitat Munchen  
Germany

Kurt Reusser  
University of Zurich
Switzerland

The development of arithmetic competence in young children is an important topic of research in mathematics education and a significant issue of interest in the EARLI community. Accordingly, we suggest an EARLI invited symposium on NUMERACY AND ARITHMETIC COMPETENCE for the conference in Munich in 2013. Numeracy encompasses the basic understanding of numerosity and the ability to apply numerical concepts. It includes a basic number sense as well as the knowledge of fundamental mathematical operations like addition, subtraction, multiplication, and division. Numeracy has a long tradition as a research issue, however, there are recent developments, which shed new light on the topic. In particular, the relationship between early numeracy and further development of arithmetic competence has been a matter of debate. Although developmental theories suggest that early numeracy is highly relevant for further arithmetic competence, empirical findings are ambiguous. Differences in the theoretical concepts (e.g., understanding of the term ‘number sense’), the methods of measurement (e.g., computer-based vs. paper-pencil testing) or the study designs (e.g., intervention studies vs. cross-sectional studies) could explain such differences. The symposium will discuss these issues and present some recent work to the EARLI audience.

The mental number line, the external number line, and elementary school mathematics

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This paper is concerned with studies on magnitude estimations that strived to explain the underlying mental representation(s) of magnitudes by using a number line estimation paradigm, in which participants are usually asked to mark the position of numbers on an external number line (e.g., from 1 to 100). Based on a brief description and discussion of several studies done in our own centers as well as recent work done by others, we propose a taxonomy by which those studies can be classified, which helps to explain why it is so difficult drawing general conclusions, and we suggest perspectives for future research on magnitude estimations, which might abandon the hunt for ‘the mathematical function’ (linear, logarithmic, power\(^\text{2}\)\(^\text{a}\)) that explains estimations best and turns, instead, to investigate the underlying estimation strategies and ways of their improvement. In doing so, we also question some fundamental assumptions underlying the use of this paradigm, namely that estimations are a probate instrument to tap the underlying mental representation.

The development of quantitative problem solving in primary school
Modelling the world with mathematics involves representing numerical information about the world and operating on these representations in order to find an answer to a question about the world. In this presentation we identify four units of thinking that are crucial in quantitative problem solving. The first two units, quantities and relations between quantities, relate to understanding the world; the third and forth, numbers and operations, relate to numerical representations and how these can be manipulated. Thus solving quantitative problems involves reasoning about relations between quantities as well as competence in manipulating numerical representations. Most children start to use numerical representations and manipulate them in order to solve problems before they start primary school. They use different schemas of action that represent relations between quantities from a very early age, and apply these to numerical representations in order to solve additive as well as multiplicative reasoning problems. Their ability to model the world with mathematics develops as they learn to use other forms of numerical representation, which afford novel ways of manipulation of the numerical information. Using this theoretical model, our presentation will provide a description of the development of multiplicative reasoning from pre-school to secondary school, and consider how the use of different representations learned over time affect how a subject approaches a multiplicative reasoning problem.

**Spontaneous focusing on numerosity in the development of arithmetical skills**

Minna M Hannula-Sormunen  
University of Turku  
Finland

The presentation reviews studies investigating children’s Spontaneous Focusing On Numerosity (SFON) and considers the role it may play in the development of arithmetical skills. SFON refers to a process of spontaneously (i.e., not prompted by others) focusing attention on the exact number of a set of items or incidents. This attentional process triggers exact number recognition and the using of recognized exact number in one’s action. The measures of SFON tendency are suggested to be indicators of the amount of a child’s self-initiated practice in using exact enumeration in his or her natural surroundings. The studies show that SFON tendency during childhood is positively and domain-specifically related to the development of arithmetical skills up to the end of primary school. Even in adults individual differences in SFON are significantly related to basic arithmetical fluency. Finally, experiences of promoting SFON as part of mathematical interventions will be shared.

**Effects of basic number skill interventions in first-grade and low-achieving second-grade children**

Andreas Obersteiner  
Technische Universitat Munchen  
Germany

Kristina Reiss  
Technische Universitat Munchen  
Germany

Stefan Ufer
Theories from mathematics education and cognitive psychology suggest two different teaching approaches to foster children's basic numerical skills: While one approach focuses on representing and processing exact numerical information (e.g., identifying number symbols, exact calculation), the other approach focuses on representing and processing approximate numerical information (estimation, comparing number symbols, approximate calculation). In two studies we contrasted the effects of both approaches on children's basic number skills and arithmetic achievement. The first study investigated learning effects in first-grade children in a highly controlled experimental setting. In the second study we developed an ecologically more valid learning environment and included low-achieving second-grade children. Positive learning effects were found for both instructional approaches, but there were hardly any transfer effects to related skills. The theoretical and practical implications will be discussed.

The Role of Research and Theory on Learning in Building Coherent Systems for Science Education

James Pellegrino
University of Illinois at Chicago
United States

Science learning in the U.S. has been weak as evidenced by performance on national and international assessments such as NAEP and PISA. Many factors contribute to such outcomes including an incoherent and poorly aligned system of curriculum, instruction, assessment and professional development. This presentation will focus on changes underway to build more coherent systems that focus on a different definition of the nature of competence. This is most clearly expressed in a 2012 NRC report in which three major elements: (1) Core disciplinary ideas; (2) Practices of Scientific Reasoning, and (3) Cross-Cutting Concepts define what it means to know science as intertwined aspects of knowledge and understanding. Discussion will consider the role of theory and research on learning in the definition of competence and in design and implementation of coherent educational systems. This includes what we know and need to know to support instructional processes that can produce learning with understanding and transferable knowledge and skills.

Metacognition and learning: Conceptual and methodological considerations revisited.

Marcel V. J. Veenman
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Netherlands

In this keynote, I will re-address some of these issues, while referring to recent findings from my own research and from research by others. First, ambiguity in terminology and definitions of metacognition is discussed. In particular, indistinct references to metacognition and self-regulated learning need to be disentangled. Next, the intricate relation between cognitive and metacognitive processes is highlighted in an extended version of Nelson’s model. This new model regards learners as active agents in the implementation of metacognitive self-instructions on the flow of cognitive activity. Third, a developmental perspective for metacognitive skills is sketched out. Although elementary forms of planning and monitoring may already be observed in very young children, steady growth of metacognitive skills occurs from late elementary school unto late adolescence. Additionally, recent longitudinal studies show a transition in metacognitive skills from being rather domain-specific to a general, domain-surpassing repertoire. Fourth, the state-of-the-art in the assessment of metacognitive skills is discussed. A research project on ‘giftedness and metacognition’
will exemplify how to use computerized tasks for the assessment of metacognitive skills, with remarkable findings. Finally, conditions are depicted for effective instruction and training of metacognitive skills, referring to both individual and classroom instruction.

**Evidence-based interventions for reading impairments**

Charles Hulme  
UCL  
United Kingdom

There is considerable evidence that learning to read depends critically upon a child’s language and phonological skills. I will present evidence from a number of recent studies by our group showing that progress in learning to read aloud (decode) depends critically upon two foundation skills: access to phonemes in speech and knowledge of letter-sounds. Reading comprehension, in addition depends upon higher-level language skills including vocabulary knowledge and grammatical skills. These theoretical findings have implications for interventions to treat and prevent reading failure in children. Recent intervention studies by our group demonstrate that interventions that target phonemic skills and letter sound knowledge help to ameliorate decoding problems in children, while interventions to boost vocabulary and grammatical skills are also effective in boosting the language skills that are the foundation for reading comprehension skills

**Understanding the interplay of student characteristics and teacher interactions in classrooms**

Tina Seidel  
Technische Universitat Munchen  
Germany

Teaching and learning in classrooms takes place in a highly complex and dynamic setting. Responsible teaching in classrooms therefore means to provide diverse students multi-faceted opportunities to learn. Despite the possibility to make use of multiple forms of organization, teaching and learning in classrooms is still characterized to a large extent by verbal interactions between teachers and students. The way teachers elicitate and guide interactions with students can be regarded as a generic pedagogical-psychological competence and has been shown to influence student learning in a positive way. In addition, student characteristics have to be taken into account when analyzing teacher-student interactions. Current models of teaching and learning all emphasize the interactive nature of those interactions in classrooms. In my presentation I will summarize recent advances in this field by drawing on video-based analyses of mathematics and science classrooms. It will be shown that teacher-student interactions are highly driven by teacher elicitation and guidance and that especially students with strong characteristics benefit from these interactions. These patterns often result in a Matthew-effect, strong students show highest learning gains, both cognitive as well as motivational-affective. Based on these findings, implications for teacher professional development are drawn. Intervention studies targeting the improvement of verbal interactions between teachers and students and effects on teacher and student learning will be presented. A main conclusion of my presentation is that verbal interaction skills should be already fostered in pre-service teacher education. An improvement would have large and long-term benefits for responsible teaching and sustainable learning.

**Approaches to early science education: children’s competencies and learning potentials**

Henrik Saalbach  
ETH Zurich  
Switzerland
Recent studies have revealed great variability in children’s performance on various measures related to science learning. This indicates the potential for an enhancement of science competencies. At the same time, an early start of a science curriculum is widely regarded as important. However, the question of how to design environments stimulating early science learning has rarely been addressed in research. With the aim of fostering advanced conceptual understanding in science, teachers need to take into account the developmental trajectories of children’s early competencies. Additionally, they have to apply effective methods that enhance the capabilities of the children. In order to design successful learning environments, the consideration of three conditions are vital: a) children’s informal learning experiences before entering school, b) children’s development of competencies and c) learning progressions that aim at developing scientific understanding. Furthermore, research has shown that learning can be promoted on the one hand, by challenging, stimulating teacher-student interaction and, on the other hand, by attractive and authentic materials within structured and problem-based tasks. Accordingly, the papers of this symposium explore children’s early competencies with respect to the categorization of animate and inanimate things, understanding the horizontality of water level and acquiring a theory of matter. The papers further examine possibilities of supporting the development of these competencies by various means of scaffoldings and interventions.

Preschoolers’ conceptions about animals, plants and nonliving things and their biological properties

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Caterina Lorenzi
University of Rome “Tor Vergata”
Italy

Cinzia Ronchi
Roma Tre University
Italy

Maria Cristina Tatano
The conceptual organization of the environment in terms of living things, natural things and artefacts is an important debated question of cognition, which has a central role in science education at school, even at preschool age. It has been showed that children first categorize objects as animals or plants, and then assign such objects to the living domain, consequently inferring defining properties from the domain in question. The main question concerning this presentation is to grasp children’s biological knowledge from 4 to 6 years of age, concerning the categorization of animals and plants as living and how the living domain is conceived in terms of defining properties (to be born, to grow, to fall ill, to eat, to breathe, to have babies, to die). The results show that the preschooler’s biological knowledge is fragmented: in the living domain, animals and plants have not the same status and possess different biological properties. The contents and characteristics of naïve knowledge of preschoolers has to be taken into account when organizing a program on elementary biology.

The impact of gestures on explicit and implicit learning about the surface orientation of liquids

Miriam Leuchter
University of Munster
Germany

Henrik Saalbach
ETH Zurich
Switzerland

In this study, we examine whether and to which extent gestures by teachers and self-produced gestures support explicit and implicit spatial learning within an early science context. In particular, we examined the development of children’s understanding of the horizontality of the water level during a short-term intervention. The micro-genetic study included 164 first-graders which were randomly distributed on four experimental groups and one control group. Instructions of the experimental groups differed along two dimensions: support by the teacher (verbally and gestures vs. only verbally) and actions by the child (hands-on action vs. observation). Explicit and implicit knowledge was tested before and after the intervention and children’s self-produced gestures during the intervention were recorded. Results of the explicit knowledge test indicate that the group with highest amount of support (gestures & hands-on action) learned best. Surprisingly, the group with least support (no gestures, observation only) learned better than the groups with either teachers’ gesture support or hand-on action. The implicit knowledge test only revealed a difference between experimental groups and control group but no differences due to the specific instructions of the experimental groups. Finally, analysis revealed a significant effect of experimental condition on number of gestures: children of the most demanding group (no gestures, observation only) produced most gestures, and, accordingly, the group with highest amount of support (gestures & hands-on action) produced fewest gestures. Our findings suggest an important role of gestures in supporting student’s learning in early science contexts.

Science learning opportunities in kindergarten - results from the SNaKE project

Mirjam Steffensky
IPN
Germany
In the research project SNaKE we compared in a quasi-experimental study with 223 5 to 6 year old children learning outcomes across different typical learning opportunities in kindergarten in the domain of science. The learning opportunities were hands-on activities and science related everyday situation and a combination of both. The experimental groups were compared with a control group (pseudointervention) and a baseline group (tests, only). Children took part in three 80-minute instructional units on melting and evaporation of water, and solving in water. Learning achievement was measured using a pre-post-follow-up design (SNAKE-test) over a period of 9 months and additionally with specific tests for each topic directly after the instructional units (mini-test). On the short term immediately after each instructional unit results show a significant higher achievement for the experimental groups performing hands-on activities, only, and the group performing hands-on activities in combination with discussions of everyday situations compared with the control group. This result was not found in the post test, here only the combination group lead to significantly higher achievement compared with a baseline group without any treatment. In the follow-up test the groups do not differ significantly.

Teaching theory of matter in primary school: The role of epistemic beliefs

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Greece

Stella Vosniadou
National and Kapodistrian University of Athens
Greece

Students face considerable difficulties in understanding scientific explanations about the physical changes of matter. We argue that this is the case because students’ naïve physics as well as their naïve epistemic beliefs constrain the understanding of scientific concepts. The purpose of our research was to design and implement a teaching intervention to facilitate the process of conceptual change in young students’ understanding of aspects of the particulate theory of matter. The innovative component of this intervention was that it took into consideration not only students’ naïve theory of matter but also their epistemic beliefs. The intervention was based on the suggested learning progression of the macroscopic concepts necessary for the introduction of the particulate theory of matter and was also facilitated by relevant software and simulations of the microscopic model. Previous attempts for designing learning environments facilitating the learning process have focused on some of these factors but not on all of them. The sample consisted of 36 fifth grade students divided into two groups, control and experimental. They were administered a battery of tasks investigating their concepts about matter and their epistemic beliefs. The results showed statistically significant differences between the experimental and control groups in all tasks, with the experimental group attaining significantly higher performance than the control group. We also found statistically significant correlations between students’ epistemic beliefs and their concept of matter, confirming our hypotheses regarding the importance of epistemic beliefs.

Working memory in children with special educational needs
In the past decades, it has become clear that working memory is strongly related to children’s academic achievement. This symposium will shed a new light on the role of working memory in learning in special groups. Two of the presentations focus on children with respectively below and above average intelligence. These studies give more insight in the relation between intelligence and working memory. Although these concepts are strongly related, the here presented studies show that children with mild intellectual disabilities could still use adequate working memory strategies, and that children with very high intelligence do not necessarily have high working memory scores. The other two presentations move a step beyond the correlational studies and have investigated how a working memory training could improve the academic skills of students with mathematical learning disabilities or attention deficits. Together these studies confirm that working memory plays an important role in learning and provide new knowledge about working memory skills in special groups of students.

**Working memory in children with mild intellectual disabilities: Verbal strategy use**

Sebastian Poloczek  
Goethe University Frankfurt  
Germany

Gerhard Buettner  
University of Frankfurt  
Germany

Henrik Danielsson  
The Swedish Institute for Disability Research  
Sweden

Lucy Henry  
London South Bank University  
United Kingdom

Claudia Maehler  
Institute of Psychology  
Germany

David Messer
For many years it has been assumed that one of the reasons that children and young people with intellectual disabilities (ID) display verbal short-term memory difficulties is that they rarely use appropriate memory strategies such as verbal rehearsal. The MIDAS project was designed to test this hypothesis directly in a cross-European study. By assessing samples from different countries using the same methodology, the generalisability of the findings could be improved. Furthermore, the project examined self-paced presentation times in picture memory tasks as well as the word length effect as two complementary indicators for verbal strategy use. One-hundred-and-ten adolescents with mild ID and 107 children without disabilities matched for mental age (MA) completed the experiment. As expected, MA children obtained slightly higher memory spans than adolescents with ID. In both groups, a significant word length effect was found, although larger for MA children. The analyses of pause times suggested that, irrespective of group membership, participants with a span of 2 pictures did not use verbal strategies while participants with a span of 3 or higher predominantly used naming or single word rehearsal. Therefore, the results suggested that some adolescents with ID apply simple verbal strategies, but that the proportion of those who did so was lower in the group with ID than in the MA group.

Working memory in gifted children with and without dyslexia

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In this study, working memory in gifted children is studied. Although working memory (WM) and intelligence are highly correlated, they are not the same. To explore this matter in more detail, we tested whether gifted children (N = 55; grade 1-4) outperform average intelligent children on different WM components, and whether this varies with age. A group of an additional 30 gifted children with dyslexia was included to test if working memory also plays a role in this group. It was found that gifted children score significantly higher than average intelligent children on the verbal and visuospatial processing components, and on the visuospatial storage component, but not on verbal storage. Yet, 20-30% of the children scored below 100 on these subtests of the AWMA. This
means that gifted children do not necessarily outperform other children on working memory, and that working memory is not the most important explanation for their gifted performance in other areas. However, the gifted children with dyslexia in this study did not differ from the gifted children without dyslexia on the different working memory tasks. Dyslexia in gifted children is thus often not caused by (verbal) working memory deficits. In this study it was indeed found that these children had more problems with other phonological aspects (phonemic awareness and rapid naming).

Effects of working memory training on math ability in elementary school children

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In the present study, two adaptive, computer-based trainings for children with MLD were compared. The first training (basic math) consisted of three tasks focusing on basic aspects of numerosity processing, whereas the second training implied three WM tasks. Seventy elementary school children from grades 3-4 (age M = 9, SD = 0.7, 39 boys) participated in the study (basic math training: n = 20, WM training: n = 19, passive control group: n = 31). Training groups did not differ significantly with respect to any test scores before training. A repeated-measures ANCOVA revealed a significant training group × session interaction, with effect sizes d(basic math) = .42 and d(WM) = .47. Helmert contrasts showed that training groups differed substantially from the control group, but not from each other. A nonsignificant training group × session interaction was found for spatial WM and verbal span. Results of this study indicate that a massed, adaptive computer-based training of either domain-specific or domain-general aspects can lead to gains in mathematical ability in elementary school children. In the full sample, a WM training appeared to be as effective in improving math scores as a basic math training.

Working memory training in children with attention deficits: Differences between boys and girls

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Working Memory (WM) has a central role in learning. It is suggested to be malleable and is considered necessary for several aspects of mathematical functioning. This study investigated how girls and boys respectively perform on WM, mathematics and reading measures before and after WM-training. Forty-two children (7 female, age = 10.7) with attention deficits worked with an interactive computerized working memory training program at school. They trained daily, for 30-40 min. for five weeks. The girls scored significant lower at baseline compared to boys in mathematics and WM measure, but not in reading comprehension or word reading. Enhancements in training scores were related to enhancements in the non-verbal WM-measure Span board back. Boys and girls improved the most in non-verbal WM and in reading comprehension. However, the girls seem to have severe problems with addition and subtraction measures. They did not improve in Digit forward, addition and subtraction at all (at T3 relative to T1). The results indicate that boys and girls in this study, aged 9 to 12 with attention deficits and special needs, may benefit over time, from WM training, as shown in the enhanced results in for example reading comprehension following WM training. However, as the girls were few the results have to be interpreted with caution.

Learning challenges and opportunities in culturally diverse settings in Higher Education

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The session aims at mapping and discussing the present state of the art in working in higher education with cultural diversity and learning, and particularly in aiming at developing intercultural competence. Today around 3 million students are studying abroad, outside their home country (Russell et al. 2010). Several universities are offering intercultural curricula, to both ‘domestic’ and international students. Intercultural competence are also particularly relevant to students whose prospective profession involves effective awareness of intercultural communication. The symposium addresses recent findings in this field exploring both the different applicability of various ‘intercultural competence’ conceptions and their relations to academic and social integration behaviours of both domestic and international students.

Exploring intercultural competences through critical incidents and participatory approaches

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This paper presents an overview of the theoretical background and research approaches concerning the use of critical incidents as educational tools with particular attention for transition situations and intercultural learning. It includes a review of criticism addressed to approaches based on critical incident analysis and discusses methodological improvements. It reviews different methodological options and explores ways to apply the critical incidents method in addressing the screening and development of intercultural competence within higher educational settings. Specific attention is given to identifying the features that support the acknowledgement of cultural differences and the construction of intercultural meaning. The concept of social categorization is discussed especially in relation to Thomas’ concept of ‘culture as an orientation system’ and Thomas’ methodology involving a micro-analytic method of data collection and its relation to ‘macro-analytic cognitive interest’ and the notion of cultural standard drawing from the large number of comparable situations of misunderstanding. Within this framework, the paper discusses implications concerning the use of critical incidents in relation to HE social sciences curricula. Such an approach is reviewed in terms of the pedagogical potential of this methodology in promoting reflective educational practice that have a potential to address cultural transitions and to provide core educational tools to classroom didactics.

Understanding formal and informal learning and social interaction processes in international classro

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An increasing number of Confucian Asian students are studying in the UK. Although a large body of research has found that some international students experience transitional and pedagogical adaptation issues, the implicit assumption of most research is that these issues will disappear over time. The primary goal of this study was to understand whether international students after three
years of study at a UK university were able to build multi-national and host-friendship as well as learning relationships. Secondly, using pre-post measurements we analysed the impact of creating multi-national groups on learning networks using social network analyses. In this quantitative study, 81 students were allocated in groups based upon their initial friendships as well as by mixing different parts of the network together. The results indicate that (even after three years) Confucian Asian students primarily lived in separate social worlds, while English and other international students developed substantial multi-national networks. Using multiple regression quadratic assignment procedures, the learning networks after 14 weeks were primarily predicted by the group allocation and initial friendships, indicating a positive effect of mixing multi-national groups.

Learning to Teach Writing in Culturally Diverse Settings: Complexity and Contradiction

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This paper seeks to address questions of complexity and contradiction in beginning secondary school teachers’ experiences of learning to teach writing in culturally diverse classroom settings from a sociocultural perspective. The teaching of writing, with pupils from a wide range of cultural and linguistic backgrounds, presents particular challenges for student teachers. This paper seeks to address questions of complexity and contradiction in student teachers’ experiences of learning to teach writing in culturally diverse classroom settings. The research presented here focuses on data from three two year case studies of beginning secondary school teachers during their training and first year of teaching. The analysis presented draws on Vygotsky’s (1987) concepts of psychological tool usage and mediated activity and Moll et al’s (1992) ‘funds of knowledge’ to explore the contradictions and complexities involved in adult learners learning to teach writing in diverse cultural settings. I argue that in a culturally diverse classroom, writing is both distributed in the sense of many participants contributing to this specific act of literacy and situated within the context of the classroom environment. Student teachers need to become responsive to the multiple sociocultural forces that shape pupils’ writing. Finally, the studies show the importance of teaching writing as a process of communication, rather than as a decontextualized skill.

Adjustment differences among first year students: the role of gender and ethnic background

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In an attempt to explain group differences in study success in the first period of studying in higher education, this paper explores the first year experience as a transition process in which adjustment to college is cyclic and dynamic. The research questions are: what types of adjustment types can be distinguished and are there differences according to gender and ethnic background in these types of adjustment? 74 students were interviewed twice. The first interview took place a few months before entering HE and explored: learning strategies, study choice, social network and expectations about going to university. After three months of studying, the second interview took place and discussed: study choice, learning environment, learning strategies, academic and social integration and academic achievement. In the data two main types of adjustment could be distinguished: ‘Flow’ers’ are students who go with the flow and seemingly adjust to university in an unproblematic way, they may be either active flow’ers or passive flow’ers. The second type are ‘Strugglers’ who face (several) problems and do not seem to succeed in adjusting in the first period and increasing their performance. They may be positive or negative. The paper describes group differences in these four types of adjustment in detail.
Young Students’ Metacognitive Processes in the Context of Self-Regulated Learning

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Individual differences in self-regulated learning skills have repeatedly been found to explain substantial amounts of variance in academic achievement, with most studies focusing on high school students, adolescents, and young adults. The link between self-regulated learning skills and school performance is much less clear for elementary school children. One reason for the relative lack of empirical evidence in this respect is the fact that central constituents of self-regulated learning still undergo marked developmental progression making investigations of the interplay of motivational, cognitive and metacognitive processes involved in learning even more difficult. The submitted symposium specifically focuses on metacognitive processes holding an intermediate position in self-regulated learning, located between a learner’s long-term achievement goals, and the task-specific cognitive operations leading to learning progress. Four empirical studies from 3 different countries are integrated in this symposium with different but typical school learning tasks used as experimental approach to the study of metacognitive skills needed in self-regulated learning situations (vocabulary learning, text comprehension, word-pair learning, and spelling). The age groups included in the planned contributions all consist of school children making a coherent and focused discussion and integration of the results possible.

Age-related progression in self-regulated vocabulary learning: Metacognition in 5-to 7-year-olds

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Contemporary models of self-regulated learning emphasize that self-regulated learning consists of a complex interplay of cognitive, meta-cognitive, and emotional-motivational aspects. Thereby, metacognitive processes seem to hold an intermediate position between, for example, a student’s long-term achievement goals and the execution of cognitive processes while learning, with online metacognitive monitoring and control playing a central role. Metacognitive skills have repeatedly
The Relation between Metacognition and Executive Function in Children's Self-regulated Learning

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Theoretically, both procedural metacognitive processes (monitoring and control) and executive functioning (EF) are psychological concepts used to describe a variety of cognitive processes that individuals use while learning with the aim to optimize their performance. Empirically, their relation is yet to be described. In the to-be-presented study, a battery of tasks targeting different aspects of EF and a multi-stage spelling task inducing and quantifying metacognitive monitoring (confidence judgments) and control (detection and correction of errors) is used in a large sample of 2nd graders (N = 120). Associations between EF and metacognitive skills (MC) were addressed on the task level (correlational analyses) and on the level of latent variables allowing an error-free estimation of the assumed relation. Results indicate that EF and MC are significantly related to each other in young primary school children, with executive tasks tapping updating, inhibition, and the fast retrieval from long-term memory being especially responsible for that link. Structural equation modeling (SEM) techniques further revealed that EF and MC are (a) empirically well distinguishable and (b) nevertheless substantially interrelated with each other. Individual differences in these two domains were then used to predict 2nd graders' academic performance. Regression analyses revealed that both EF and MC significantly predicted academic outcomes, with the EF tasks explaining additional variance in achievement, over and above MC. Results will be discussed in the context of contemporary models of self-regulated learning.

Improving text comprehension through cooperation and metacognitive roles

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A student's ability to learn from texts is essential for self-regulated learning. This study focuses on cooperative learning as a possible solution for overcoming difficulties in text comprehension for individual students. Four-hundred and two primary education students were distributed in three conditions: individual learning, cooperative learning, and structured cooperative learning emphasizing metacognitive monitoring and control processes while learning with texts. The results show positive effects on both performance scores and mental effort ratings for cooperative reading,
but only for 5th and 6th graders. Third and 4th graders did not seem to benefit from working together. Moreover, whereas 5th and 6th graders showed a slight and non-significant benefit from receiving specific metacognitive roles, 3rd graders were actually severely hindered by these roles.

From the Classroom to the fMRI scanner: Neural Mechanisms behind Self-Monitoring and Self-Regulation

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Behavioural research has demonstrated that monitoring the study process helps students regulate learning more efficiently. The mechanisms of monitoring one’s own knowledge are still under debate, but it has been suggested that memory processes are involved. The first study aimed at exploring the role of memory during monitoring by directly comparing brain activity during recall and Judgments of Learning (JOLs) of paired associates. Brain activity was measured during JOL and retrieval, occurring at different time lags from encoding (8 seconds, 100 seconds, 24 hours) Using multivariate analyses, we verified the hypothesis that immediate JOLs are based on working memory networks, while delayed JOLs involve long-term memory retrieval. Our results confirmed the hypothesis that memory is an essential cue for making JOLs. A second study investigated developmental differences during self-regulation of learning. It has been proposed that students develop a study agenda that takes into account multiple variables (difficulty, reward structure of the task, feedback, etc.). Making learning successful requires therefore accurate planning to allocate attentional resources correctly. Younger and older adolescents learned paired associates. Before each word pair, they were prompted with information regarding the difficulty and the reward of the upcoming material. Analyses indicate that reward influenced regulation more than difficulty, and that different brain networks were involved in these parts of agenda setting. Different activations patterns are also observed in younger and older adolescents, reflecting the important neural changes occurring during development.

Assessing motivation and regulation in computer-supported individual and collaborative learning

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Marja Vauras
Successful learning requires the regulation of learning activities and of motivation, especially in the context of computer-supported collaborative learning. The current state of the art offers a variety of assessment methods to address motivation and regulation during computer-supported learning, on both the individual and the collaborative level. This symposium brings together methods for assessing motivation and regulation in (nearly) real-time during learning (see the contributions by Schoor et al., and by Deiglmayr & Spada), for feeding back assessments to learners in order to help them regulate their learning (Schoor et al.), for identifying specific challenges in group regulation and motivation based on a combination of quantitative and qualitative analyses (Nykki et al.), and for identifying factors moderating the effects of motivation on learning using a meta-analytic approach (Quesada-Pallarés et al.). While the meta-analysis of Quesada-Pallarés et al. provides a big picture of how self-efficacy and transfer relate under different design conditions, the motivation feedback tool applied by Schoor et al. can be used to further investigate different conditions and for supporting group regulation. The Motivation Sampling Tool of Deiglmayr and Spada proved useful to analyze and compare individual learner’s cognitive and motivational reactions to specific collaboration events, such as the creation of new knowledge. Finally, the combination of quantitative and qualitative methods employed by Nykki et al. provides an in-depth analysis of socio-emotional challenges arising even in high-achieving groups.

Meta-Analysis as a tool for assessing motivation and regulation in digital simulations

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This contribution argues that meta-analysis is a useful tool for assessing the outcomes of motivation and regulation in computer-supported collaborative learning (CSCL) and technology-enhanced learning (TEL). Using the example of efficacy beliefs and transfer in digital simulations, we illustrate how meta-analysis estimates the outcomes of motivational, self-, and social regulatory processes as a function of instructional design variations that exist between k=15 individual studies with a total sample size of N=2,274 learners on two layers. First, results for CSCL indicate non-significant differences between individual and collaborative learning. Second, results for TEL indicate that high levels of user control resulted in higher estimates of self-efficacy and transfer. Offering assessment feedback after rather than during training led to higher self-efficacy and transfer. Effects of narrative and multimedia characteristics were non-significant. These findings are discussed in terms of their practical implications for instructional design in CSCL and TEL and their significance for future research.

Assessing and feeding back motivation during computer-supported collaborative learning

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In computer-supported collaborative learning (CSCL), group awareness tools can provide support for learners regarding their collaboration. The main idea of group awareness tools is that information about the group’s state (like participation or available knowledge) is assessed and fed back to the group. A key task for successful learning during CSCL is the co-regulation and socially shared regulation of learning. Motivation is one component that influences regulation and that is object of regulation. Group awareness tools on motivation have been used only in a few studies in which it had positive effects. It is assumed that the motivation feedback is used by the learners to recognize motivational problems and to regulate their group learning accordingly by, for example, talking about the problems. Therefore, it was the aim of the present study to further investigate the effects of assessing and feeding back motivation during CSCL. In our experimental study, triads worked on a collaborative learning task either with (N = 33) or without (N = 18) a motivation feedback tool. Triads with a motivation feedback tool were either prompted to discuss their results or not. We assessed motivation and knowledge before and after their work. We found no effect of the motivation feedback tool on motivation or knowledge. These results indicate that a motivation feedback tool is only effective under specific circumstances which must be further researched.

Assessing metacognitive appraisals and motivational states in (nearly) real-time during CSCL

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In collaborative learning scenarios, interactive knowledge co-construction generates new, shared knowledge between learners. Further, successful collaborative learning typically also involves co-regulation in which individual and co-constructed metacognition, as well as learners’ motivational states, play an important role. In our on-going research project, we assess learners’ appraisals of the state of their collaboration, resulting from metacognitive monitoring and leading to positive or negative motivational states. In this paper, we present first results from the implementation of a brief, five-item questionnaire designed to assess students’ metacognitive appraisals and motivational states at multiple time-points during collaboration: after pre-defined, solution-relevant collaboration events vs. non-relevant control events. The tool proved a feasible possibility of obtaining real-time data without disrupting collaboration. First results show that students, even though answering independently from one another, do indeed report similar motivational states (correlations between r= .31 and r= .47) and similar metacognitive appraisals of the importance of collaboration events (r= .57). Discrepancies between students reports were larger regarding their attributions of
responsibility for important collaboration events, with many attributions following social desirable, ‘modest’ patterns that favour attribution to joint, rather than one’s own, effort.

**How small groups regulate collaborative learning: video analysis of groups’ productive engagement**

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The aim of this study is to explore how groups regulate their collaborative learning and which processes facilitate or detract groups’ productive engagement. The data collection was a part of a higher education students’ learning sciences course. The participants (N = 22) studied in groups of four to five students for twelve weeks. The data consists of the five groups’ video recordings in six face to face collaborative learning situations, learning outcome tests and stimulated recall interviews. This paper introduces a cross-case analysis of two well-succeeding groups, whose learning and regulation profile was similar. Both of the groups were high achieving based on the learning test outcomes, and the amount of regulation processes was high in both groups. However, cross-case analysis indicates that the two groups differed in their level of engagement and in their socio-emotional interactions. In sum, both groups achieved their learning goals and performed well in their learning tasks, but only one group engaged in socio-emotionally satisfactory learning experience and experienced success as a group.

**Gender & STEM: International perspectives on students’ motivation, career aspirations and choice**

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There has been a great amount of international research conducted to understand the gendergap in STEM professions, however, the underlying reasons for the continuous gender variations instudents’ motivation, career intentions and choice of math and science courses remain unclear. This symposium brings together international quantitative and qualitative work from Australia, the Netherlands, Germany and Norway, concerning individual and social pre-conditions of adolescents’
motivation, career aspirations and choice behavior related to the STEM area. All four presentations adopt an expectancy-value approach and draw on gender-specificities in learning processes, discussing which aspects are crucial for the ‘leaky pipeline’ in students’ STEM participation. The first presentation focuses on students’ motivational profiles in math and science, their relations to gender and their differences with respect to achievement factors and wellbeing. The second presentation addresses the relation of personality characteristics and students’ subject choices as well as the role of gender as moderator of these associations. The third presentation draws on social factors by examining longitudinally relations among perceived parental support/value and students’ interest in math. The fourth presentation highlights organizational aspects by investigating how the attendance of the event such as ‘Girl’s day’ influenced the choice processes of secondary students with mathematics and physics specialization. In line with the presented results the symposium discusses implications for teaching and learning in math and science. Thereby individual, personality-related, social and organizational and cultural dimensions related to students’ motivation, career aspirations and choice in the STEM area are highlighted.

A Math/Science Expectancy-Value Typology: Implications for career aspirations & wellbeing

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Using established measures of expectancies, intrinsic and utility values, as well as a new multidimensional measure for the seldom researched negative ‘cost’ values (from Perez, 2012), this study explored a typology of grade 10 learners (N=438) in mathematics and science, and consequences for related career aspirations and psychological wellbeing. ‘Positively engaged’, ‘Disengaged’ and ‘Struggling ambitious’ types were identified within both domains, and an ‘Indifferent’ type in mathematics. The types systematically differed along achievement, achievement-striving and wellbeing dimensions; girls were overrepresented in the Disengaged type, and boys in the Struggling ambitious for mathematics, consistent with cultural stereotypes for girls and social pressures and expectations for boys. Theoretical and educational implications are discussed.

The role of personality in relation to gender differences in students’ school subject choices

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Boys and girls to some extent differ in personality characteristics while they also prefer different school subjects in secondary education. This study has attempted to unravel the relations among gender, personality, and students’ subject choices. The study was based on a sample of 1,740 9th grade pre-university students throughout the Netherlands (average age 15 years). We used the Five-Factor Personality Inventory (FFPI) of Hendriks, Hofstee, and De Raad (1999) to measure the students’ personalities. The research questions were: (1) To what extent are students’ personality characteristics related to their subject choices in secondary education? (2) Do students’ personality characteristics mediate the gender, subject choice relation? And if yes, which personality
characteristics are responsible for this? (3) Is the relation between personality characteristics and subject choices different for boys and girls? We found several associations between personality characteristics and students’ subject choices. Although the relationship between gender and students’ subject choices was slightly attenuated after the inclusion of the personality characteristics in the multinomial logistic regression analyses, gender remained an important predictor of the students’ choices. The personality factor Extraversion partially mediated the relation between gender and students’ choice of advanced mathematics, chemistry, and physics versus a more language and culturally-oriented set of school subjects. Furthermore, gender was found to moderate the relation between the personality factor Autonomy and students’ choice of advanced mathematics, chemistry, and physics versus a more language and culturally-oriented set of school courses.

**Parental support and valuing as predictors for students’ interest in mathematics**

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Subject-specific parental values and school-related parental support are highly related to female and male students’ development of subject-specific interest and motivation. The present study examined longitudinally the relations among students’ reports of parental values and parents’ perceived usefulness of mathematics, parental school-related support, students’ interest and performance at time 1 and students’ interest at time 2. Longitudinal Structural Equation Modeling based on data of a questionnaire study points including data from 361 eighth to tenth graders from ten schools in Berlin, Germany. Results revealed that parental school-related support and students’ interest in math at time 1 predicted students’ interest in math at time 2. Single group analyses for both gender-groups showed that in the male subsample, parental school-related support and interest in math at time 1 predicted interest in math at time 2. In the female subsample parental valuing of math and students’ interest in math at time 1 predicted interest in math at time 2. In the full-sample only the path between parental valuing of math at time 1 and interest at time 2 was moderated by students’ gender. Theoretical and educational implications are discussed.

**Female STEM participation in Norway: Experiences from the recruitment event ‘The girl’s day’**

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We draw on results from two Norwegian studies and look at students’ motivations for choosing secondary physics and mathematics, and how the recruitment event ‘The girl’s day’ might encourage females to go on to university studies in STEM. We use questionnaire data from 585 Norwegian secondary physics and mathematics students in 2008 to characterize the ‘physics and mathematics choosers’. An expectancy-value perspective is adopted to describe the motivations and expectations behind the respondents’ choice, alongside their plans for future education and careers. Many of these students planned to go into medicine (females in particular) or engineering (males in
particular), but a large proportion of them also appeared to be uncertain about which educational paths to follow. The results suggest that secondary physics and mathematics students are likely to welcome initiatives that offer information and support towards upcoming decision points. Further, we investigated how attending the event ‘The girl’s day’ in 2011 influenced the choice processes of secondary students with mathematics and physics specialization. Questionnaire responses from 189 participants and focus group interviews with 17 participants suggest that ‘The girl’s day’ influenced the expectations and values the students’ attach to studying STEM. The key factor appeared to be meeting university students in STEM. The study demonstrates how expectancy-value perspectives provide a fruitful lens for looking at how recruitment initiatives may affect students’ STEM-related choices.

What can drawings tell us about drawing to learn?

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Recently, there has been renewed interest in the way that drawing can support learning with most studies showing that it can be a highly effective way to learn. However, this is not invariably the case and moreover there can be wide variation in how much people learn as they draw. The four papers in this symposium explore the drawings learners created during process of learning. They assess whether drawings reveal important aspects learners’ understanding of the topic, can provide insight into the underlying cognitive mechanisms that are implicated in drawing to learn, reveal whether some drawing practices are more effective than others and identify individual differences that may moderate the benefits of drawing to learn.

Drawing characteristics and learning outcomes

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We analyzed the drawings of 22 participants who were learning about skeletal muscle. Learning material included X provided diagrams and participants constructed 7 diagrams to replace diagrams that were missing from the instructional material. A posttest, which included both verbal and non-verbal items, measured learning outcomes. Drawings were coded for Accuracy, Similarity (to provided diagrams), Number of Words, and number of Content (structure and process) elements.
included. Both Accuracy and Content Process scores were strongly related to posttest scores. Content Process scores accounted for a significant portion of the variance shared between Accuracy and learning outcomes.

**Understanding students’ science drawings**

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We analysed the drawings made by 68 students about the topic of ‘Energy of the Earth’, a basic topic for understanding the greenhouse effect. Drawings were scored on represented objects and processes in the domain. Factor analysis of the drawing scores showed that drawings varied along two axes: ‘heat vs. light’ involving the kind of energy transfer that was chosen as central, and ‘roles of the atmosphere’ in which the way representations of the way atmosphere functions varies between drawing. Analysing drawings in this way provides insight in learners’ scientific ideas about the domain and is in principle generalizable to other domains. Further research should indicate whether the process of drawing itself puts limits to the way learners represent complex phenomena.

**Does drawing ability or drawing training influence learning from science texts?**

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There is increasing evidence that drawing can help people learn from texts. However, this is not invariably the case. The study reported in this paper explores whether the effectiveness of drawing to learn depends upon a learners skills at drawing and whether training in drawing strategy can help overcome any limitations. 62 University students learnt about the respiratory system by reading 17 text passages and drawing a diagram after passage. Half of these were provided with initial training in drawing to learn (focusing on being explicit and transferring information from text). All participants completed the Bender Visual-Motor Test to assess their drawing ability. Prior and post the intervention, participants completed a range of knowledge tests. Analysis showed that drawing ability nor drawing training directly influenced learning outcomes. However, there was a significant effect on the drawings themselves with drawing training and drawing ability both increasing the content of diagrams as well as their perceived clarity, which in turn were related to learning outcomes.

**Why drawing aids learning from science texts: Contrasting drawing with self-explanations**

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Kim Colin Stalbovs
In the present study we contrasted two explanations for why drawing during learning from text is helpful. According to the first explanation, drawing aids learning, because it, similar to other learning strategies such as self-explaining, supports the identification of relevant information and generating of inferences. According to the second explanation, effects of drawing are more specific in that they go back to the fact that during drawing a pictorial representation is constructed. N = 74 seventh-graders were first instructed on how to either create drawings or self-explain when studying science texts. A practice task aimed at familiarizing students with the two learning strategies. In a subsequent learning phase, they were prompted to apply their strategy to a novel text, whose contents had to be recalled in the final test phase. Moreover, transfer questions had to be answered. Results showed that students in the drawing group tended to show better recall performance and managed to apply their strategy more comprehensively than those in the self-explanation group. The beneficial effect of drawing became more clear-cut for those learners, who had used their strategies intensively during learning. The results confirm the second explanation in that they show that drawing had a beneficial effect on learning above and beyond generating self-explanations, which is due to constructing a pictorial representation in addition to a verbal one derived from instructional text.

Teachers' Knowledge and Beliefs in Science and Mathematics

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Within established models of teachers' professional competence and expertise it is assumed that teachers' professional content knowledge (CK) and pedagogical content knowledge (PCK), as well as teachers' beliefs, contribute significantly to teachers' professional behaviour (Baumert & Kunter, 2006; Bromme, 1997; Shulman, 1987). Recent empirical studies show that these teacher characteristics influence instructional quality as well as students' achievements in mathematics and science, but also that teachers differ significantly with regard to their knowledge and beliefs (Baumert et al., 2010; Hill, Rowan, & Ball, 2005; Kleickmann, 2008; Staub & Stern, 2002). Although these findings illustrate the relevance of CK, PCK, and beliefs in general, several open questions remain. These will be addressed in this symposium which unites researchers from various countries and backgrounds. The first question is concerned with the measurement of CK, PCK, and beliefs. Until recently, many studies have used distal indicators (e.g., state certifications) or self-reports to measure teacher quality. Instead, some of the studies in the symposium present new scales and tests
aiming to assess teachers’ knowledge and beliefs directly. The second question is how teachers’ knowledge and beliefs develop and how they interact. Several studies in the symposium present findings from longitudinal studies on these issues. Third, some of the studies presented investigate how teachers’ knowledge and beliefs can be influenced through interventions and teacher education.

The Influence of Discourse Quality in Teacher Induction Programs on Beginning Teachers’ Beliefs

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This study investigates how discourse quality in teacher induction programs affects beginning teachers’ reflection and beliefs about teaching and learning mathematics. In a longitudinal study, transmissive and constructivist beliefs of 536 German teacher candidates in their two-year induction phase from 100 different seminars were assessed twice by questionnaires, with an interval of one year. In addition, the teachers’ reflection, their motivational-affective resources (self-efficacy, enthusiasm and emotional exhaustion) and their perception of discourse quality in the seminar (‘discussing different points of view’ and ‘sharing experiences only’) was assessed. Multilevel regression analyses confirmed a mediation effect: In seminars where candidates actively discussed different points of view, they showed higher levels of reflection. Reflection, in turn, boosted their constructivist beliefs and reduced their transmissive beliefs. This mediation effect was not found in seminars where experiences were shared but not juxtaposed. The association between ‘discussing different points of view’ and reflection was moderated by beginning teachers’ enthusiasm and emotional exhaustion. The results support the relevance of deep processing and individual resources for the process of belief change.

Tracing Teachers’ Epistemologies About Student Ideas in a Two-Year Professional Development Program

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Teachers’ beliefs about student knowledge have been framed as personal epistemologies, or beliefs about the nature of knowledge and knowing. We hypothesize that the process of noticing and attending to student thinking, also known as formative assessment - may support teachers in developing different epistemological positions about their students’ knowledge of science. This paper analyzes data drawn from a two-year professional development that focused on a department of high school biology teachers participating in an on-site professional development that had as its goal the design, enactment, and revision of common formative assessments about natural selection. We analyze teacher statements about student ideas to explore how teachers’ epistemological positions about student knowledge as they develop, enact, and revise formative assessments over time. Results show that teachers’ epistemological positions shift between absolutist and multiplist during various stages of the professional development cycle. For example, as teachers reflect on their
enactment of formative assessment in the classroom their conversations reflect more of a multiplist epistemological position. This study suggests that enactment of and reflection upon formative assessment can facilitate teachers’ framing of student thinking away from right-wrong perspectives towards a greater understanding of the array of student ideas in science.

Pre-service Elementary and Lower Secondary Teachers’ Knowledge about Rational Numbers

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For most elementary and secondary students the transition from natural to rational numbers is far from evident: They often incorrectly ascribe characteristics of natural numbers to rational numbers, a phenomenon known in the research literature as the ‘natural number bias’. To properly address students’ conceptual difficulties about rational numbers, (pre-service) teachers need appropriate content knowledge (CK, i.e., a profound knowledge of rational numbers) and pedagogical content knowledge (PCK, i.e., knowledge of instructional strategies to present rational numbers taking into account students’ (mis)conceptions). There is evidence that the CK and PCK of pre-service teachers in mathematics is limited, although systematic and large-scale studies in the rational number domain are missing. This study aims to meet this gap by systematically investigating (1) pre-service teachers’ CK and PCK about rational numbers, (2) the relation between CK and PCK, and (3) the difference between pre-service elementary and lower secondary teachers’ CK and PCK. We administered a new paper-and-pencil test that was especially designed to investigate teachers’ CK and PCK about rational numbers to 158 pre-service elementary teachers of three teacher training institutes and to 34 pre-service lower secondary teachers of two teacher training institutes. The results reveal, first, gaps in elementary and lower secondary pre-service teachers’ CK and PCK. Second, it was found that pre-service teachers’ CK is a necessary but not a sufficient condition for pre-service teachers’ PCK. Third, whereas pre-service elementary teachers performed significantly worse on the CK-items than pre-service lower secondary teachers, no significant differences were observed on the PCK-items.
Assessment of Primary School Teachers’ Knowledge and Beliefs About the ‘Nature of Science’

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The concept of ‘Nature of Science’ (NoS) refers to an extensive and comprehensive understanding of the more general aspects of scientific reasoning, and is assumed to be part of the concept of ‘Scientific Literacy’ (e.g. Zimmermann, 2007). Results of recent studies indicate that students’ understanding of NoS may be a prerequisite for their construction of science concepts (e.g. Grygier, 2008). Finding determinants for students’ understanding of NoS therefore seems to be necessary. Since empirical studies from other areas (maths/science) indicate that teachers’ professional knowledge (distinguishable into CK, PCK and beliefs) has an influence on their students’ learning outcome, it is assumed that also teachers’ knowledge and beliefs of NoS influence their instructional behaviour, and therefore their students’ conceptual development in science (e.g. Hofer, 2008). However, only few studies have been conducted with regard to the assessment of teachers’ knowledge and beliefs about NoS, which results in a lack of testing instruments. This study shows results of the development of instruments for the assessment of primary school teachers’ CK, PCK and epistemological beliefs (EPI) in NoS. We developed two scales assessing teachers’ PCK and EPI, and adapted an existing instrument measuring CK (SUSSI) into a German version. Two scales (EPI/CK) show acceptable reliability (r=.66-.83), while the PCK scale’s reliability remains relatively low (r=.61-.66). Probably due to the generally low levels of competencies displayed by the teachers, resulting in restricted variance, correlations between the involved scales are not significant. These results and their relevance for practical applications (e.g. teacher training) are discussed.

Strategy Change in Mathematics: The Impact of Personal Characteristics and Learning Opportunities

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Strategy change in mathematics and particularly the flexible switching and adaptive use of different strategies is important for acquiring expertise and mastery in mathematics and the theme has therefore become an important research area. This symposium brings together four empirical contributions focusing on strategy change. In the first contribution, a microgenetic design is used to investigate the role of individual differences in intelligence, working memory capacity and prior knowledge for students’ adaptive strategy use and to test the role of feedback on strategy change. In the second contribution, the authors investigated how students’ strategy changes and flexibility is dependent on teachers’ characteristics. In the third study, students with mathematical difficulties were tested on their strategy use and the authors discuss whether flexibility is a feasible aim for those students. In the fourth and final contribution, strategy change is induced through a training intervention and the difference between procedural and fact retrieval strategies are examined from a neurophysiological perspective. Taken together, the different contributions foster the understanding of processes that are related to strategy change in mathematics, they shed light on how learning opportunities can contribute to strategy change, if individual differences can moderate flexibility in strategy use, and the question of how adaptive expertise in mathematics can be enhanced in a classroom setting is discussed.

Teacher and Instructional Characteristics Related to Students’ Gains in Flexibility

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Flexibility in problem solving has been widely recognized as an important skill for students’ mastery of mathematics. Here we investigate teacher and student characteristics and instructional practices that may be associated with students’ gains in flexibility in algebra. Teacher and student data were collected from 8th and 9th grade Algebra I teachers in Massachusetts as part of a larger study on the impact of a researcher-developed year-long supplementary curriculum that focused on improving students’ flexibility. We explore differences between teachers whose students achieved the greatest gains in flexibility during the study (upper quartile) and those whose students achieved the least gains (lower quarter). Our results indicate that high and low gain teachers did not differ any teacher demographics. However, high gain teachers’ students had higher prior knowledge but lower flexibility at pretest, as compared to low gain teachers’ students. In addition, although high and low
gain teachers did not differ in their implementation fidelity, high flexibility gain teachers more frequently used the supplemental Algebra I curriculum in their instruction.

**Strategy flexibility in algebraic problem solving under an individual difference perspective**

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The ability to choose problem solving strategies flexibly and adaptively is an important part of expertise. However, it is unclear how simple forms of problem solving practice affect flexibility. We also investigate to what extent flexibility in strategy use is dependent on learners’ characteristics as intelligence, working memory and prior knowledge in the domain and to what extent these individual differences influence how a student can exploit a learning situation. In a microgenetic design with 24 trials of a mathematical problem solving task, we found that ninth-graders adaptivity of strategy choices increased linearly during practice without feedback and that feedback on strategy adaptivity facilitated the process. Adapting strategy choices to problem types led to shorter solution paths, higher solution rates, and higher speed. This is true independently of students’ intelligence or working memory capacity. However, prior knowledge was a predictor of adaptivity, thus fostered adaptive problem solving behavior. Specifically, adaptivity in equation solving in trails prior to the actual study trail and conceptual knowledge on equivalence fostered the adaptivity of students’ solution strategies for the equation tasks. These results are discussed with regard to meaningful school instruction.

**Do children with mathematical difficulties use the subtraction by addition strategy?**

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In the last decades, variety and flexibility in children’s strategy use has become a major aim in mathematics education. For children with mathematical difficulties (MD), however, there remains discussion whether it is feasible to aim for strategy variety and flexibility. Some researchers, curriculum developers and policy makers advise to teach children with MD only one way of solving problems. In the domain of mental subtraction, for instance, children with MD are typically taught to always use a direct subtraction strategy to solve problems such as $52 - 48$. However, for problems with a relatively large subtrahend compared to the difference, subtraction by addition appears to be a more efficient strategy. In the present study, we focused on the spontaneous use of the subtraction by addition strategy in 27 children with MD, using non-verbal research methods. Results showed that children with MD flexibly switch between direct subtraction and subtraction by addition strategies based on the relative size of the subtrahend, similar to our previous work with typically developing children. Our findings are of great relevance for mathematics education as they challenge special education classroom practices that only focus on the routine mastery of the direct subtraction strategy, and on the routine mastery of mental calculation strategies in general.

Training-related changes in arithmetic strategies and underlying brain activity

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Based on a long tradition of research on mathematics education showing that children and adults use different strategies to solve arithmetic problems, neurophysiological studies have recently begun to investigate the brain correlates of these strategies. In this study, we address this issue by training participants in using fact retrieval strategies. In addition, we investigate whether brain activity related to arithmetic fact learning is domain-specific. Twenty adult students were trained on sets of two-digit multiplication problems and figural-spatial problems. After the training, they were presented with the trained and untrained problems, while their brain activity was recorded by means of electroencephalography (EEG). In both problem types, the training resulted in high accuracies and strong decreases in solution times. Analyses of the oscillatory EEG data also revealed training effects across both problem types. Specifically, we observed training-related activity increases in the theta band and decreases in the lower alpha band, especially over parietal brain regions. These results provide the first evidence that the transition from procedural to fact retrieval strategies is reflected in significant changes in oscillatory EEG activity. Moreover, these findings corroborate the role of the theta band in the retrieval of semantic information from memory and suggest that theta activity is not only sensitive to fact retrieval in mental arithmetic but also in other domains.

Measurement, Structure, and Validity of Language Competency

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Language competency is crucial for success in school and in occupational settings. Consequently, the assessment of language competency in large-scale assessments (e.g., PISA) as well as classroom settings has received increasing attention in the last decade. Important research questions concern the dimensionality and discriminant validity of language competency assessments and their psychometric properties. The reliability and validity of different modes of language assessment is crucial for the diagnosis of individual learning needs. The aim of this symposium is to shed light on these issues. The first two contributions focus on the structure of language competency. Whereas the first paper examines C-tests as indicators of general language proficiency and their relationship to four basic language skills (i.e., reading, writing, speaking, and listening), the second paper focuses on the distinction between language reception and production and further broadens the perspective by investigating how different facets of language competency are related to cognitive abilities. The third paper focuses on the validity of different measurement approaches by comparing self-evaluation on the Common European Framework of Reference for Languages (CEFR) with standardized test results both within countries and cross-nationally. To conclude, the fourth paper investigates whether productive grammatical knowledge can be validly assessed with the analyses of written productions. The findings of the papers are relevant for assessments of language competency and for the interpretation of the respective results in educational settings on the individual, national, and cross-national level.

How well does ‘general language proficiency’ explain language test performance?

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The current research addresses the seemingly contradiction between the multiple findings of C-tests loading on a single general language proficiency (GLP) factor on the one hand, and the assumption that language proficiency as considered by language testing researchers is multi-dimensional. Research on the structure of language proficiency and in psycholinguistics suggests that GLP may best be represented as the common core across diverse language measures. In the present research, it is hypothesized that C-tests are excellent measures of this common core. In contrast, other language measures, beyond putting demands on GLP, are assumed to tap unique processes, explaining why multi-dimensionality often best reflects the structure of language measures. The current research addresses this hypothesis by examining structural equation models that evaluate alternative assumptions about the dimensionality of language proficiency. 222 students from the highest academic school track in Luxembourg completed a French C-test, as well as the Test de Connaissance du FranÇais (TCF), encompassing measures of reading, listening, speaking and writing. The results show that the four TCF measures put extra demands on unique processes,
whereas the C-test measured GLP only. The findings point out that the C-test should not be expected to replace measures of the four basic language skills, i.e., of reading and listening comprehension, or of written and spoken production, when a clear diagnostic of language proficiency in one of those domains is needed.

Structure and Validity of Language Competency in German (L1) in Secondary Education

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One fundamental issue of language assessment in educational large-scale studies is the dimensionality of language competency: Are theoretically and conceptually different domains like reading and spelling best accounted for by a strong general language proficiency factor or do they reflect only moderately correlated dimensions of language competency? While most empirical studies support a distinction between language reception (e.g., reading) versus production (e.g., writing), others support the general factor model. Only a few of these studies have also taken established cognitive abilities into account. We report results of a study based on 6,701 German high school students in grades 8 to 10. A matrix test design was used to collect data on five different language domains in the native language German (i.e., reading, listening, writing, orthography, language usage), reasoning, declarative knowledge, and C-tests. Multidimensional IRT scaling and structural equation modeling revealed a pattern which partially supports the reception-production distinction. However, contrary to expectations, writing was highly associated with reading and listening. In a latent regression model, 88 percent of the variance in a higher order language factor could be explained by knowledge and reasoning. We conclude that frequently used measures of language competency are highly related with each other and with established cognitive abilities. Implications for the development and interpretation of language assessments are discussed.

How Common is the Common European Framework of Reference for Languages: Insights from the ESLC study

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In the context of the European Survey on Language Competences, students in 16 countries were asked to assess their language competence using ‘can-do’ statements from the Common European Framework of Reference for Languages, relating to the skills of reading, listening, writing, and speaking. Apart from the self-assessment, students also completed a language test. In relating the self and objective assessment to each other, it was found that a) both are strongly related in every country, and b) that the relation is different in different countries. That is, answering ‘Yes, I can.’ to the question ‘I can recognise significant points in straightforward newspaper articles on familiar subjects.’ (Reading, CEFR level B1) is indicative of higher reading ability. However, students with the same reading ability have different probabilities to endorse the same can-do statement. This signifies that the can-do statements, which are meant to be interpreted in an absolute sense, are actually interpreted in a relative sense by students. Our observations suggest that the answer to the question ‘How do I know that my B2 is your B2?’ posed by Charles Alderson, might be ‘I don’t’, which makes the Common European Framework of Reference somewhat less common.
Assessment of grammatical competencies of students who learn German as a second language

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German grammar is a subdomain of language competency that learners of German as a second language have considerable difficulties in acquiring. As language proficiency is key to subject matter learning in school, the ability to validly and reliably assess grammatical skills and to identify individual learning needs is important. Grammar skills are often assessed by analyzing students’ written productions since only very few diagnostic instruments are available for the assessment of grammatical competencies in German as a second language for elementary school children. This paper studies whether the analysis of written productions can serve as a valid measure of grammatical competencies. Short narratives written by 181 third graders were analyzed with regard to the correct usage of verbs, nouns and correct word order. These results were compared to the outcomes from a standardized test of productive grammar use that more directly elicited these grammatical constructions using a gap-fill-task. The results show that the analysis of written narratives tends to overestimate students’ grammatical competencies. In written texts, students deliberately choose grammatical constructions posing no difficulties to them. Thus, free written productions are no valid measure of grammatical knowledge. This finding raises some doubts about the widespread use of written productions by teachers for assessing grammatical knowledge and identifying needs for additional language support. The results stress the importance of standardized assessments which can be used in classroom settings.

Eye Tracking: a Research and Instruction Tool To Examine and Improve Learning Processes and Outcomes

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Eye-tracking methodology is receiving increasing attention in the field of learning and instruction, especially in research on multimedia learning. This methodology provides quantitative and objective data on the allocation of visual attention to track cognitive processing while reading texts or inspecting static or dynamic pictures. Eye-tracking technology also makes it possible to replay eye movements on a video. This symposium extends current research to indicate that eye tracking is not only a research, but also an instruction tool to promote deeper processing and learning of declarative
and procedural knowledge. The studies included in the symposium consistently show that eye tracking, as a research tool, allows for various indices reflecting different cognitive processes. The studies also indicate that as an instruction tool, eye tracking offers a unique opportunity to model novices’ visual behavior through the replay of an expert’s eye movements. The symposium includes a coherent and integrated set of papers that complement each other; all examining the essential relations between processing and learning performance. The first paper sets the stage to show which cognitive processes are crucial for multimedia learning. The other three papers provide evidence of the effective use of eye-movement modeling to guide visual attention with the aim of fostering processing and learning in secondary school and university students. The symposium, therefore, has both scientific and educational relevance: it documents the basis for successful learning performances, and that eye tracking can be used effectively to teach how complex material can be processed for better comprehension.

Which Cognitive Processes Predict Successful Learning with Multimedia?

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The Cognitive Theory of Multimedia Learning (CTML) assumes that learners have to select, organize and integrate information from text and picture in order to benefit from text-picture combinations. Moreover, it has been shown that processing the picture prior to reading the text was beneficial to multimedia learning compared to processing the text before the picture. The aim of the present study was to investigate whether these assumed beneficial processes do in fact predict successful learning with multimedia. Therefore, students (N=160) learned with a multimedia instruction about mitosis and meiosis, and several eye tracking measures served as indicators for students’ cognitive processes. To assess the relative importance of the different cognitive processes regarding learning success, a multiple linear regression analysis was conducted. The analysis revealed that both integrative transitions between corresponding text paragraphs and picture elements as well as the frequency of looking at the picture prior to reading text significantly predicted learning outcomes. Results thus suggest that aside from the cognitive processes assumed by the CTML, there might exist other cognitive processes that can have functional relevance for learning with multimedia.

Improving Text and Picture Integration during Reading through Eye-Movement Modeling

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Successful learning from illustrated texts requires integrating information provided by the text and pictures. To extend current research, this study used eye movement modeling examples (EMME) in the school context to model the crucial integrative processing of text and graphics and to examine the effects of this modeling on processing and learning outcomes. Forty-two 7th graders participated in the study, randomly assigned to the experimental (EMME) or control conditions. Before the learning episode, each participant in the EMME condition individually observed a replay (video) of a model’s eye movements while reading an illustrated science text on a topic (water cycle) different from that of the learning episode (food chain). Based on the theoretical assumption of a successful reading strategy, the visual behavior of the model replay emphasized the integrative processing of text and picture. Results revealed that students who observed the eye-movements of the model replay, showed more strategic, integrative rereading of the learning material than the control students. The EMME students spent more time attending the illustration while rereading corresponding text segments. They also backtracked to the corresponding and non-corresponding text segments for longer while reinspecting the illustration. Further, EMME students outperformed the control students in less and deeper learning tasks, such as verbal recall, graphical recall, and transfer of knowledge. We conclude that eye-tracking methodology is not only a research tool but also an instruction tool that can be used effectively to model students’ reading behavior in the school context.

Activating Visual Attention Guidance Before Learning Leads To Better Comprehension

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Recent research on eye movement modeling has shown that presenting experts’ eye movements in a learning environment can foster learners’ comprehension. We raised the question of whether an activation of eye movement patterns in a content-free environment would also foster comprehension of a following narrated (static) visualization on the causal relations in a technical system. Forty-four university students were randomly assigned to a group with an eye movement training and a control group without training. Learning outcomes were assessed by three subscales referring to the structures, processes, and functions of a technical system. We found that groups did not differ on structures. However, the training group learned more about processes and functions. Although groups did not differ on eye movement measures, there was a positive and strong relationship between eye movements and learning outcomes in the training group indicating that longer dwell times on and more transitions to narration-congruent areas were related to better comprehension. We conclude that congruent modeling of learners’ eye movements prior to the presentation of the learning material can lead to benefiting eye movements during learning. Future research should, therefore, investigate the missing direct link between condition and eye movements as well as different modes of training (e.g., incongruent, variations in length) and learning materials.

Effects of Seeing the Model’s Head on Learning From Video Modeling Examples: An Eye-Tracking Study

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In video modeling examples, another person (the model) shows students how to perform a task. Such examples can either show the model entirely, partly (e.g., zooming in on the hands), or not at all (i.e., screen recordings of the model’s computer screen). This study investigated whether seeing the model’s head in the video would hinder learning. This could be the case because eye-tracking research on hearing other people tell about an event while gesturing has shown that participants mostly look at the storytellers’ faces and hardly at the gestures; for learning, however, the focus should be on what the model is demonstrating. On the other hand, in learning situations, the attention focus might be directed more towards the task being demonstrated than when hearing someone relate an event. In this experiment, 43 participants twice studied a video modeling example in which a problem-solving task was demonstrated and in which the model’s face was either visible or not and subsequently attempted to solve the problem themselves. Results showed no performance differences on the first attempt, but a marginally significant advantage for the condition that did see the model’s head on the second attempt (i.e., after the second example had been studied). The eye movement data for this condition showed a decrease of the number of fixations on the model’s head during the second observation of the example. The number of fixations on the demonstration area did not differ between conditions either on the first or second observation.

**Differential effects of quality of early education and care on language acquisition over time**

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By now it is widely understood, that early education and care can have positive impact on children’s’ cognitive development (e.g. Camilli, Vargas, Ryan & Barnett, 2010). Moreover, analysis point to the importance of quality of education and care and its relation to later child outcomes. Particularly, Burchinal et al. (2009) find that higher-quality early care is related with modestly higher language outcomes. But a literature review proves only that measures of educational quality vary with regard to many characteristics even so in their ability to predict child outcomes (Burchinal et al. 2010). It is the aim of this symposium to discuss various measures and aspects of quality and its effect on language acquisition over time. Educational quality is considered at different levels: First, Portuguese preschools different dimensions of the environment rating scale (ECERS-R) were measured and their relations to language outcomes are discussed (Leal, Lima & Cadima). Second, broad and narrowly defined indicators of literacy quality on individual child level and on classroom level are compared and evaluated using the German BIKS-Study (Kuger, Rossbach & Weinert). Third, quality of teacher-led group talk and peer talk and its influence on language acquisition are considered for second language learners in a Norwegian sample (Ryland & Aukrust). Finally, a Dutch study (Lesemann & Henrichs) points at raising quality of care through professional development in an ongoing longitudinal action research/evaluation project. Overall, the symposium underlines the importance of educational quality and shows that different facets of quality provide differential predictive power.
Associations between dimensions of quality and children outcomes in preschool and first grade

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This study aims to examine the associations between specific dimensions of early childhood education quality and child outcomes at the end of preschool and first grade, namely concepts about print and social skills. Data were collected on 52 preschool classrooms and 168 four and five year old children. One year later, children from the initial 5 year cohort who were attending first grade were assessed again, totaling 119 children. The quality of classrooms was evaluated with the Early Childhood Environment Rating Scale, revised (ECERS-R; Harms, Clifford & Cryer, 1998). Children were evaluated in two moments using a direct measure, Concepts about Print (Clay, 2003) in their preschool and school settings. Preschool and school teachers rated children using the Classroom Behaviour Inventory (CBI, Schaefer, Edgerton & Aaronson, 2006), at the end of each school year. The results indicate that the Language-Reasoning subscale was a significant predictor of the literacy outcomes, but not of the social skills, whereas the Interaction subscale proved to be significantly related to both literacy and social outcomes. The Program Structure subscale, however, was a less consistent predictor of child outcomes. These results highlight the importance of considering specific aspects of quality that can be useful at theoretical and practical grounds. They further emphasize the continued effect of quality throughout first grade.

A Comparison of Early Childhood Literacy Support on Classroom level and on Individual Child Level

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Children’s literacy skills and their antecedents start developing very early in life. Next to the family setting, preschools are an important learning context for children prior to school enrolment. Overall, research results point to a strong influence of the quality of stimulation in the classroom on children’s literacy development. The quality of stimulation is a complex construct for which some aspects are more important, whereas others are less important for domain-specific learning support. The research field displays a number of different ways to define educational quality and provides about equally manifold ways and methods to assess it. Most assessment methods for educational quality are observational instruments that measure the quality of stimulation in the classroom as a
whole on the one hand or the quality of stimulation that is experienced by a single child on the other hand. The two levels of measurement assess different aspects of educational quality; they are partially independent of each other, yet both are predictive of children’s literacy development. This paper analyses single and combined longitudinal relations between quality at the classroom level and at the single-child level and later reading literacy in a sample of 45 preschool children from the beginning of preschool to the end of the second grade in primary school. Results show that both levels of measurement predict reading literacy in primary school independently of each other but even better when both measures are combined. Implications for further research and preschool practice are discussed.

The long-term impact of preschool dialogues for Turkish immigrant children’s Norwegian vocabulary

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Little research has explored how preschools can support children’s second-language (L2) vocabulary development. The present study investigated whether the role of teacher-led group talk and peer talk (amount and richness) in preschool can predict the L2 vocabulary trajectories of children after they leave the preschool environment. We followed 26 Turkish immigrant children growing up in Norway from preschool (age five) to fifth grade (age ten). The results of our growth analyses revealed that both teacher-led group talk and peer talk predicted children’s L2 vocabulary skills at age five. As expected, preschool talk exposure did not affect children’s vocabulary growth during their elementary years. However, the initial differences in vocabulary skills associated with preschool talk exposure were maintained up to age ten, even after controlling for maternal education and neighborhood of residence. This finding underscores the importance of both preschool teacher-led talk and peer talk for L2 learners’ vocabulary development.

Actively improving Early Childhood Education as scientist. Ongoing action research in the Netherlands

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The current paper reports on the findings of two studies in the realm of Early Childhood Education (ECE) in the Netherlands. The first study has finished, whereas the second study concerns an ongoing project that was designed as a follow-up study of study 1. Study 1 indicated that, while literacy and math activities in ECE classrooms had significant positive effects on child outcomes, such academic activities made up a relatively small proportion of a typical preschool day. Study 2 was therefore
designed as longitudinal action research, in which the researchers actively engage in fostering the educational quality in ECE classrooms.

**Understanding and Promoting the Agency of Children in Classrooms and in Everyday Life**

Kristiina Kumpulainen  
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Jennifer Arnold  
Australian Catholic University  
Australia

Antti Rajala  
Helsinki University  
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Asa Makitalo  
University of Gothenburg  
Sweden

The symposium is concerned with understanding, promoting and researching children’s agency in their everyday life and in educational settings. The symposium reflects a growing interest among educational researchers to study empirical manifestations of children’s agency in its various forms. Agency involves, for example, taking individual or collective action in everyday and pedagogical practices to skillfully cope with or transform these practices. This variety and richness of empirical manifestations of agency is reflected and tackled also in the contributions of this symposium. Informed by socio-cultural conceptual frameworks and methodologies, the contributors investigate agency maintaining focus upon its socially and culturally mediated enactments. The first two presentations focus on relational and collective aspects of children’s agency as learners in social interactions of educational settings. Rajala, Kumpulainen, Lipponen, and Hilppi; explore children’s ‘relational agency’, and Arnold and Clarke develop the concept of ‘agentic positioning’ to study opportunities for student agency. The third and fourth presentations focus on children’s own accounts of their agency. Hilppi, Lipponen, Kumpulainen, and Virlander examine children’s sense of agency in everyday life through analyzing their ‘modalities of agency’. Finally, Siry employs participatory methods for foregrounding children’s subjective agentic accounts and for using these accounts to transform social practices in early childhood settings. Taken together, these contributions provide rich complementary conceptualizations and empirical investigations of children’s agency. In particular, the different contributions highlight the subjective, collective, relational, and transformative aspects of agency. Educational implications include promoting children’s agency in its many forms in and across a variety of settings.

**The manifestation of relational agency in social interactions in extended spaces of learning**

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Kristiina Kumpulainen  
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Finland

Lasse Lipponen
Educational research is often dominantly concerned with epistemic aspects of students’ learning disregarding relational aspects that should arguably be considered as integral to any learning process. In this paper, we build on the notion of relational agency to focus on the relational aspects of students’ peer interactions in instructional settings. Relational agency is defined as ‘a capacity to engage with dispositions of others in order to interpret and act on the object of our actions in enhanced ways’ (Edwards & D’Arcy, 2004, p. 147). We report on the video-based analyses of social interactions of a classroom community of eighteen fourth graders and the teacher working in an extended space for learning that includes learning activities in the classroom and in a school field trip. Informed by socio-cultural theoretical framework, the data were analyzed with interaction analysis. We follow one focal student pair while they move and interact in these learning spaces. We ask: What forms of relational agency, if any, are manifested in these social interactions? How does the social context, including its practices, interactions and resources, create opportunities, and on the other hand challenge, the social construction of relational agency among the students? In the presentation, we demonstrate how relational agency was manifested in various forms in the social interactions of the students and show opportunities and constraints that the social contexts posed for the emergence of relational agency. The study makes an empirical contribution to investigating contextual manifestations of relational agency in extended spaces of primary education.

Science students’ sense of collective agency: A case study of successful female students

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Australia

David Clarke
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Australia

This research contributes to understanding and promoting student agency in science. The focus of the presentation is findings from a study of student agency in a science classroom in Melbourne, Australia. The study was concerned with the opportunities for agentic positioning made available to students in their science classroom discourse and was conducted as an instrumental case to explore the analytic potential of discursive psychology for researching agency. Data was generated from classroom video and audio recordings of science classrooms filmed for the duration of an entire unit of work. The case study was constructed on a small group of female students, who were successful according to the local assessment practices. The students’ small group was found to operate like a sub-community of practice. Features of the students’ discourse were a strong sense of collective agency as members of their small group, and a lack of social resources for the development of personal agency. Explicit acknowledgement of the function of such small group collectives in general classroom practice could serve to empower students whose individual agency is otherwise limited. Such conventionalisation of collective agency could have significant benefits for both cognitive and affective aspects of the students’ classroom experience and emerging practices as learners of science.

Sense of Agency and Everyday Life: Children’s Perspective
This socioculturally informed study investigates children's sense of agency in relation to different practices of their everyday life. Furthermore, we extend existing empirical research on sense of agency by drawing on narrative semiotics, namely on modalities of agency. The empirical data derived via children as co-researchers methodology comprise of reflection situations where four elementary school children (age 9-10) reflect on their everyday life with the help of photographs they had themselves taken. In addition to highlighting how modalities of agency were situationally talked into being within the reflection situations, our analysis reveals two distinct manifestations of children's sense of agency. These manifestations - thin and thick sense of agency - make visible the variation of children's sense of agency regarding the different practices and activities they participate in. In all, our study illuminates that children's perspective on their everyday life is not one of merely adhering to rules and actions of others, but as one of including sense of freedom and choice; different domains of life, persons and artefacts, afford children various possibilities to act as authors of their own lives.

Examing children's agency within participatory research structures

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This study explores the use of visual, participatory research methods with primary school children. Image-based research sought to engage children as central participants in the research process, as children created and analyzed images and communicated to adults across differences in new ways. There are two primary claims from this work. First, open-ended participatory research structures mediated children’s taking of agency, as children positioned themselves as experts on their own knowledges. Second, children agentically created new structures in the classroom, which supported multiple perspectives on the phenomena and experiences. This in turn led to further investigations. In this way, the act of investigating was framed as a collaborative endeavor between students.

From Adaptive to Specific: Effects of Video-based Instructional Approaches on Teacher Learning

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Alexander Groeschner
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The use of classroom videos in teacher education is still an exceptional case. As recent research shows, classroom videos are useful tools to foster pre- and in-service teachers’ ability to evaluate their own or others’ teaching with different perspectives (Brouwer, 2011). Thus, video-based instructional approaches vary with regard to research and educational goals. According to Borko et al. (2011) current video-based approaches can be categorized within a continuum from highly adaptive to highly specified. Highly adaptive approaches (e.g. video study group) are guided by learner-oriented goals and resources of participants and general guidelines for facilitation. In contrast, highly specified approaches (e.g. Learning and Teaching Geometry Program) focus on task-oriented goals and elaborated facilitation activities and materials. The symposium aims to show effects of different video-based instructional approaches in pre- and in-service teacher education with regard to this continuum of rather adaptive and/or specified strategies. The presentations provide insights in various designs and instructional measures. Finally, findings reveal how video is used differently to support certain learning processes. References: Borko, H., Koellner, K., Jacobs, J., & Seago, N. (2011). Using video representations of teaching in practice-based professional development programs. ZDM, 43(1), 175-187. Brouwer, N. (2011, April). Imaging teacher learning: a literature review on the use of digital video for preservice teacher education and professional development. Paper presented at the annual meeting of the American educational research association, New Orleans.

The LTG Project: A Highly-Specified, Video-Based Approach to Teacher Learning

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The Learning and Teaching Geometry (LTG) project has created and piloted highly-specified, video-based PD materials in the domain of geometry. The LTG PD is aimed at supporting teachers to meet the challenges of teaching geometric similarity in accordance with the new U.S. Common Core State Standards, which require defining and applying similarity from a transformations-based approach that is likely to be new to most teachers and students (Seago, Driscoll, & Jacobs, 2010). The LTG PD contains 54 hours of PD that are aligned with the definitions and applications of similarity presented in the CCSS. The intervention is a practice-based PD with clearly defined mathematical goals, designed to engage teachers through the use of videocases in which specific and increasingly complex mathematical ideas are presented within the dynamics of classroom practice. The videocases offer insight into what an emerging understanding of similarity looks like, and encourage teachers to consider specific instructional strategies that can foster this understanding.

Video Analysis in Teacher Education – Learning With Own and Others’ Videos

Kathrin Krammer
The ability to analyze classroom situations is considered to be one key feature of successful teaching. It encompasses noticing of and interpreting features of classroom teaching that are relevant for student learning. This analytical competence is grounded in knowledge of conditions of effective teaching on the one hand, and in the ability to apply this knowledge in actual practice on the other hand. In our project we investigated in an interventional study with approximately 150 participating pre-service teachers whether and under which conditions their analytical competence can be improved by case-based working with classroom videos in the course of one semester. One intervention group worked in a more adaptive way with videos of their own teaching while the second intervention group worked in a more specified way with videos of other, unknown experienced teachers. The control group, by contrast, did not work with videos at all but dealt with teaching materials and narrative descriptions of teaching situations. The increase in teaching-related analytical competence was assessed by means of a video-based, internet-supported instrument with open and closed questions which allows a proximal evaluation of the competence in noticing of and giving reasons for features of classroom teaching pertinent to student learning. In our presentation, first findings of our project with respect to case based learning with own and others’ videos in initial teacher education will be set out.

**Effects of structured video feedback on experienced teachers’ quality of instruction**

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In this symposium contribution, first results are reported from an intervention study in which the effectiveness of video feedback provided to teachers with the help of structured viewing guides was evaluated. 16 experienced primary school teachers in an experimental group received structured video feedback on lessons in writing composition for 10-11 year old pupils from colleagues and fourth-year preservice teacher education students, while a control group of 23 teachers did not. Analysis of pre- and post-intervention self-assessments in both groups and observations in the experimental group indicates that the teachers in the experimental group reported greater improvements in developing the teaching behaviours targeted in the intervention than the teachers in the control group. Implications of these findings for designing, implementing and upscaling video use in teacher education and professional development are discussed.

**Case-based learning in teacher education: Effects on emotion, motivation & analysis of practice**

Jurgen Schneider
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Marcus Syring
Universitat Tubingen
Dealing with complexity and transferring scientific theory into practice are two major challenges in teacher education programs. Case-based learning represents a possibility to meet these challenges in an effective way. Current approaches in teacher education particularly focus on reflection or the professional analysis of practice as a facet of reflection. However, it is still underexplored how case-based learning environments can be arranged to foster the analysis of practice and what kind of emotion, motivation and cognition are evoked in the learning process. In our study we assigned 400 pre-service teachers clustered in 20 similar courses on classroom management to one of the following two case-based learning conditions. These conditions used different instructional approaches (direct instruction/more specific vs. problem-oriented learning/more adaptive). The professional analysis of practice as well as emotion and motivation concerning case based learning are measured as dependent variables in a pre-posttest. In addition emotion, motivation and cognitive load are assessed during the learning phases via short questionnaires. Preliminary results show that participants in the more adaptive condition were able to interpret cases at a qualitatively higher level and estimated their motivation higher than members of the more specific group.

Morality, Religion and Education

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Though there is a long tradition in moral psychology we do not have an appropriate explanation why people do not act in line with their moral judgment especially in morally relevant situations. But in
fact they do so every day: in social relations, within the family, in business, politics or the public. We register that in these contexts new kinds of immoral behavior emerge, e.g., cyberbullying, in addition to immoral behavior which is apparent all over the world. In order to prevent immoral behavior and to support moral development, we need deeper insights in how immoral behavior develops and how moral behavior can be fostered. In this symposium we refer to James Rest’s (1999) four component model of moral action. The model assumes that moral motivation is one necessary component for acting in a morally adequate manner. To date, a large body of research exists of two Rest’s components: moral judgment and moral sensitivity. But we do not know enough about the impact of these components on moral behavior. Additionally the component of moral motivation has been insufficiently elaborated for a long time, but is now becoming the focus of an increasing number of studies. In this symposium the papers represent some of the current as well as contrasting approaches to moral motivation. All the papers explain their own perspective on moral motivation. All these approaches have different educational consequences. These will be opposed and sophisticatedly underlined by the discussant.

The growth of moral motivation. Some conductive context conditions

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Growth of moral motivation was longitudinally observed in a representative West German sample from ages 4 (n=200) till 22 (n=156). At ages 4, 6, 8 moral motivation was measured by justified emotion attributions to a hypothetical wrongdoer, at ages 17 and 22 by a rating procedure based on justified action decisions in moral conflicts and emotion attributions to self in the role of an actor as well as a victim of a hypothetical transgression. This measurement procedure was validated (by real life experiments in childhood and number of delinquent acts in early adulthood - self-reported ones as well as officially noted ones by the police). On average there was a steady increase in strength of moral motivation; individual trajectories however varied greatly. Especially in boys a decrease in strength of moral motivation was observed during adolescence. This decrease was mediated by identification with gender roles: In line with collectively shared gender stereotypes subjects had ascribed more morally aversive attributes to men and morally conducive traits to women.

Spirituality, Notions of Self and Education in Moral Motivation

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The paper will draw on the links to be found in updated psychological and neuroscientific research between spiritual intelligence and consciousness, on the one hand, and moral sensitivity and moral motivation, on the other hand. Furthermore, it will place this connection in an educational framework, with special reference to updated values education research.

Moral motivation – New evidence against traditional views on the Happy-Victimizer-Phenomenon

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Karin Heinrichs
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Germany
The concept of ‘moral motivation’ (MM) in moral psychology and education was introduced for two different but related purposes: The first is to explain the so-called Happy-Victimizer phenomenon (HV) from a developmental perspective, the second is to explain the purported gap between moral judgement and moral action. The present contribution is intended to show that the two theoretical roles that MM plays oppose each other, that MM cannot possibly be a kind of personal disposition that develops at a certain point in people’s biographies and that what we mean by MM is much more context-dependent than the proponents of the concept seem to believe. Therefore, we argue, that the phenomena associated with MM (or the absence of it) need a new theoretical basis, and make suggestions as to how it could be explained as well as what that would entail from an educational point of view.

Different Motivational Structures for Moral and Civic Actions

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This paper deals with differences with respect to moral and civic motivation based on moral sensibility in the field of political issues. Therefore we study whether and what ways of thinking, concepts, attitudes and behavior tendencies in the field of politics can be moralized. Former research demonstrated the absence of correlation between typical moral thinking on the one hand and typical political thinking and judgment on the other hand. What we found is that some political questions do not rely apparently to morality: E.g. to decide upon a new circle route around a city primary is a question of political interest, and afterwards a question of financial possibility and a question of decision power. Other political questions rely explicitly to morality: E.g. to decide upon immigration of political refugees primary is a moral question, a question of human rights and then maybe a question of feasibility with respect to financial and organizational issues. We analysed data from the ICCS large scale survey on civic behavior, thinking and feelings, but also data coming especially out of the Swiss sample only, such as moral stage data from Rest’s DIT. We found that attitudes towards immigrants are seen as motivationally either strong negative or very strong positive. Otherwise, attitudes towards pure political power does not lead to very high motivational force.

New Frontiers in CSCL Part 2: Examining the emergence and outcomes of regulation in collaboration

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John C. Nesbit
Successful teamwork is increasingly necessary for learning in and beyond school (Strijbos, Kirschner & Martens, 2004). To succeed, groups need skills for regulating themselves (SRL), each other (CoRL), and together (SSRL). Regrettably, many learners lack regulatory skills and struggle to develop them when they work on complex collaborative tasks (Hadwin & Winne, in press; Hδkkinen & Jδrvelδ, 2006; Strijbos et al., 2004). Left on their own, learners often fail to interact productively in groups. Computer supported collaborative learning environments (such as those described in New Frontiers in CSCL Part 1), afford opportunities to guide and support regulation not just knowledge construction. This symposium presents a new generation of CSCL empirical research examining the role of regulation in collaboration. Papers examine aspects of self-regulation, co-regulation, and/or socially shared regulation. Each paper in the special issue (a) specifically identifies what is regulated (task knowledge, self knowledge, goals and plans, strategy knowledge, motivation or emotions, etc.), (b) presents empirical findings to show how regulation emerges or influences collaboration, (c) identifies and discusses conditions under which regulation emerges (or does not emerge), and (d) identifies two critical targets for future research about regulation in CSCL.

Exploring other-regulation in collaborative groups: Implications for socioemotional interactions

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Social regulation research has focused on differentiating who regulates the group, with a distinction made between other-regulation and socially shared regulation. Other-regulators are typically characterized as facilitating other’s understanding (Hadwin & Oshige, 2011), but there is evidence that some other-regulators can be directive in conducting the regulatory processes for the group (Rogat & Linnenbrink-Garcia, 2011). Given that directive regulation often provokes conflict and limits equitable involvement, there may be consequences for group process. The current study investigates the regulatory processes employed by facilitative and directive other-regulators within collaborative groups, and the influence on the group’s socioemotional interactions. We observed the interactions of three small groups of middle school students during two collaborative inquiry-based science tasks. Frequencies and percentages of participation, regulation type, and whether regulation was taken up, ignored or rejected identified the other-regulator(s) within each group. We then drew on the codes to characterize the other-regulation, and relations with socioemotional interactions. Findings suggested that facilitative and directive other-regulators had the highest percentage of total regulatory moves and employed a greater range of regulation types. However, these other-regulators could be differentiated in the quality of their employed regulation. Directive regulation involved attempts to control group members’ contributions and failed to provide rationale for positions in ways that ultimately fostered experiences of low cohesion and disrespect. Future research might investigate how other-regulators negotiate their role as leader within the group and the impact on participation and group process over time.

Promoting motivational awareness in small group collaborative learning

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We present a study resulting from a teaching innovation project, which aimed at testing a particular online tool for promoting motivational awareness and regulation in collaborative learning, in a LMS supported blended setting. 10 groups of 5 students each, freshmen from a Teacher Education Bachelor program participated in the study during two semesters. Qualitative, interpretive, analysis of voluntary forum interaction and self-report final questionnaires was undertaken. A two-way analysis procedure (bottom-up and top-down) was followed in order to establish and refine the categories of analysis. Final results from a selection of contrasting groups will be presented to illustrate variations in the use of this awareness tool and its effects for motivational regulation. Groups were different in terms of their predisposition to use the regulation tool. Results show that these contrasting groups differed as well in their task organization and in the whole learning process. Eventually, strengths and weaknesses of the motivational tool will be discussed.

Tracing university students’ construction of shared task perceptions in online collaboration

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As collaboration is increasingly emphasized in academic and work contexts, learners are required to develop skills for regulating their work with others. The purpose of this study is to examine how groups construct shared task perceptions in online collaboration. Participants included 18 graduate students collaborating in small groups over a seven-week course across three learning phases. Using solo and group statements of task interpretations, chat data, and log files, we compared learning situations in which groups had accurate or inaccurate shared task perceptions to examine (a) how groups brought together individual perspectives to construct shared task perceptions, (b) activities groups undertook to construct shared task perceptions, and (c) how individual group members contributed to constructing shared task perceptions in their group. Findings indicated that while groups’ shared task perceptions tended to focus on shallow task features, groups’ with accurate task perceptions more often acknowledged multiple perspectives of group members and engaged in more discussion of the task. In addition, a greater number of individual group members contributed to this process in high accuracy groups. Findings hold implications for supporting construction of shared task perception in CSCL environments and illustrate the need for examining multiple data sources at both the individual and group level.

Socially Shared Regulation in Online Groups
The current study examines how socially shared regulatory processes in a group occur online across three different tasks, whether or not students engage in extended social interaction across these tasks, and whether the contributions of individual students change over the course of the three tasks? Five members of an online discussion group completed three online tasks using a chat room in a course management system. The group was randomly selected for analysis from the five groups in the class. The topics addressed theories of learning. Chat logs were analyzed to address the questions listed above. Preliminary results show that self regulatory processes were engaged and improved over time.

**Rocky Paths in Teachers' Professional Development: the role of critical incidents**

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Considerable research on teacher’s professional development has focused on various programs and pathways in which teachers learn and develop professionally. Some consider teachers’ professional development as a steadily increasing line. This symposium focuses, however, on instances in teachers’ professional lives in which they report a decline in their development and the way they and their educators deal with these situations. The studies in this symposium focus on both beginning and experienced teachers’ development in four different countries. We all found critical incidents or declines in teachers’ professional development which we consider to be crucial in relation to the development of teachers’ professional identity. Theories about learning, and about learning to teach in particular, include detailed descriptions about the various ways people tend to learn. But often, these theories do not pay much attention to critical incidents or declines in the development of teachers. Among the theories that do, it seems that in these processes of non-learning, defense of one’s identity is a powerful reason to resist learning, and this typically occur in situations in which people take up new role in their lives. For example, when they prepare to become teachers. Understanding the sources of critical moments in (learning to ) teaching and consequently resistance to learning and professional growth among adult learners is a first step to support change in various contexts in teacher education. Furthermore, it may provide valuable insights for teacher educators to
support student teachers during teacher education for instance by acknowledging moments or periods of resistance and giving students space to reflect on their role as a teacher.

**Key incidents in student teachers learning**

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Jacobiene Meirink  
Leiden University  
Netherlands  

Helma Oolbekkink-Marchand  
Radboud University  
Netherlands  

This study focuses on the question of why student teachers stay in teaching even after a profound ‘practice shock’, i.e., a shock that in itself seems to characterize the complex and emotionally challenging first year of student teaching. Using a storyline technique the study investigates student teachers views of their first year of teaching by examining how they picture their development, their key experiences during that development, and the ways in which they coped with these experiences. The results suggest that most student teachers perceive their own development not as a steadily ascending line as is often suggested by research on the development of teachers’ professional identity. Instead, we now surmise that most student teachers view their development as a path with highs and lows that include transformative moments or periods. This relates to Mezirow’s (1990) idea of transformative learning and to theories on identity development that suggest people need a crisis for identity development to occur. During such a crisis, we saw that student teachers explicitly reconsidered their connections to teaching and that this reconsideration led to a regained motivation for teaching. It appeared that supervisors or mentor teachers played a significant role in first year (student) teachers’ regaining motivation for teaching.

**Academics’ processes of developing as teacher and identity formation within professional development**

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The present study aimed at exploring academics’ processes of developing as teacher and identity formation within a professional development programme. This insight is needed to provide effective training for university teachers. A qualitative, longitudinal research design was chosen to create an accurate and rich picture of academics’ development processes. Eight academics with various backgrounds attending an academic development programme were interviewed, their teaching practice was observed and their reflection in teaching portfolios was documented. Data was thematically analysed resulting in case studies reconstructing individual academics’ development. A cross-case analysis revealed common patterns of development. Findings indicate that the professional identity with which academics enter the programme and identity formation processes play a significant role in the development as teacher. The predominance of a teacher (in contrast to a researcher) identity e.g. seemed to facilitate development in teaching. Processes of identity formation as teacher, e.g. changing from knowledge transmitter to facilitator of students’ learning, appeared to entail anxiety and had the potential to hamper development. Further results indicated that academic development in some cases led to a shift to student-centeredness. In line with
previous research, instances of teaching practice could be identified as facilitating development, however, in conjunction with reflection and training input, they seemed to initiate more significant development. Implications for academic development are discussed, such as paying more attention to the diverse identity formation processes in academic development and addressing related difficulties in order to provide more effective academic development.

**Becoming a self-regulated learner? Patterns of student teacher learning**

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Student teacher learning is suggested to be a key not only for teacher’s professional development but also for providing meaningful learning environments for the pupils in the school. However, previous research on student teacher learning has often focused on how students should learn instead of analyzing how students actually learn. Moreover, the absence of problematic aspects of student teacher learning in the literature has been criticized. In this study 19 class teacher student’s theme interviews and retrospective storyline’s are used to analyze student teacher learning. The results showed several patterns of student teacher learning that also differed with regard to internal consistency. Many of the patterns showed inconsistencies that may indicate lack of understanding, willingness or skills of self-regulative learning. Student teachers’ learning paths differed also with regard to amount of critical learning experiences reported. The results suggest that more attention should be paid on promotion of student teachers active agency during teacher education.

**Understanding the role of critical moments in the process of educational change among teachers**

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David Brody  
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Capturing the dynamic process of teacher learning in professional development has been an elusive challenge to researchers. In this study, we examine critical moments in the professional lives of seven teacher educators in an ongoing course based on a communal model to infuse thinking into their teaching. Using storyline methodology, we have analyzed the self-reported events which mark progress and regression in adapting innovative change. Findings reveal a process of constant ‘instructional dialogue’ assessing student learning related to the target innovation. Ineffective student learning defined negative critical moments leading to unfavorable self-evaluation, a denigration of expertise, and a challenge to teachers’ professional identity. This negative process lead to resistance to change in the professional development course. Mentoring and group support were found to counter these negative critical moments, suggesting that the internal dialogue can be shifted positively to the social arena. The teacher educators in this professional learning project were found to confront ‘adaptive challenges’ rather than ‘technical challenges’ of a simpler nature.

**Scholarship of Teaching and Learning – Concepts and Research in Higher Education**

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Jan Fendler  
Friedrich-Schiller-Universität Jena  
Germany  

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Centre for Academic Development and for Research in Higher Education  
Germany  

The Scholarship of Teaching and Learning (SOTL) is a growing international movement in higher education (Huber & Hutchings, 2005; Hutchings & Shulman, 1999). It builds on many existing concepts and movements in higher education such as academic development, classroom and program assessment, reflective practice, peer review of teaching, and educational research on quality of learning and teaching. Teaching is no longer seen just as an obligatory, and often less esteemed or appreciated aspect of academic work that can be learned by just doing. Rather, teaching in higher education is meanwhile seen as a profession based on specific knowledge about teaching and learning, and as an expertise that has to be developed (Boshuizen, Bromme, & Gruber, 2004). Expertise has been defined and investigated with respect to specific abilities, (i.e. competence), years of studying or practicing in a domain (i.e. experience), and knowledge (i.e. cognition). This symposium aims at the presentation and discussion of different concepts and research studies that firstly describe the concept of SOTL, and secondly, highlight relevant aspects for the support of development of SOTL. Especially, the symposium will focus on important questions such as how SOTL may be understood in comparison to educational expertise, which role teaching experience and the interaction between teachers and learners play, and what kind of knowledge about teaching is needed to improve teaching in higher education. Furthermore, engagement of academics in research in a discipline and in research on teaching, and their consequences are discussed. The symposium includes contributions from five different countries.

Inquiry in the context of university teaching: The scholarship of teaching as a social practice  

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Although once described as an ‘amorphous’ term (Menges & Weimer, 1996, p. xii), the scholarship of teaching has gained much clearer contours since colleagues at the Carnegie Foundation first introduced this notion (Boyer, 1990). We now have international conferences and journals carrying the precise words ‘scholarship of teaching and learning (or SOTL)’ in the title, on many university campuses we witness more conversations about teaching and some of the pedagogical studies and/or innovations shared at conferences or through journals have enriched our understanding of teaching and student learning. Nonetheless, there remains a lack of an overall conceptual or theoretical framework that could offer guidance for this work. Such a framework would take account of the definitions, interpretations and traditions that have evolved but importantly it would raise questions about the value or desirability of present forms of engagement with (the scholarship of) teaching. In this presentation I examine whether, and under what conditions, our engagement in the scholarship of teaching and learning, SOTL, is an activity that fulfils the criteria of a ‘practice’, in the particular sense in which Alasdair MacIntyre (2007) construed the term. My purpose is twofold: firstly, to explore what the scholarship of teaching and learning would look like if it satisfied MacIntyre’s (2007) criteria of a ‘practice’ and secondly, to delve into the question of whether something of true import is at risk if the scholarship of teaching were not, or ceased to be, a practice thus construed.

Why would universities advance the scholarship of teaching and learning in higher education?
Nobody opposes the advancement of scholarship with respect to university teaching and learning (SoTL). However, from a university’s viewpoint, advancing scholarship implies reallocation of resources that could have been devoted to research. This presentation focuses on the rationale of investing in SoTL. What are the outcomes? Are these proportional to the costs? A case (Utrecht University) is studied with respect to its educational policies from the early 1990’s until now with regard to fostering scholarship of teaching and learning. Utrecht University is a research university said to value education and to invest significantly in educational development. Various costly measures have been taken, such as a mandatory teaching qualification scheme, support for innovation, and an educational leadership programme. Which contextual features and motives led to these policies? Which line of argumentation proved to be convincing? Which outcomes are valued and used to justify policies and investments? How does Utrecht compare to other universities, nationally and internationally? Perhaps somewhat surprisingly, there has never been much interest to directly correlate or relate scholarship to student learning outcomes. There is other evidence that suggests that investments in scholarship pay off: Utrecht University has found itself improving with regard to ratings on national polls, staff satisfaction, reputation, portion of students that graduate in time, but also with respect to acquiring research grants. The presentation focuses on analyzing these correlations in order to understand somewhat better the complex relationship between university teaching and university learning outcomes.

The Scholarship of teaching and learning - promoted or hindered by experienced university teachers?

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To support students’ self-regulated and lifelong learning the ‘Shift from teaching to learning’ (Berendt, 2004) emphasizes that university teachers should be able to reflect on their practice (Sch, 1987), and to connect their prior knowledge about teaching and learning with evidence of higher education research. The discourse about teaching and educational innovation shared at universities has enriched the understanding of teaching and students’ learning. This movement is known as the ‘Scholarship of teaching and learning (SoTL)’ (Hutchings & Shulman, 1999) including crucial questions relating to teaching and learning, to inquiry, and reflectivity. Most of the university teachers still ‘learn teaching by doing’ (Wildt, 2009), and very few of them are really trained for teaching in higher education. Teaching experience, as personal experience gained in own university studies, as a student, and later on during attempts as university teacher, still represents the main precondition for practicing teaching in higher education. Less is known about the relevance of teaching experience for the quality of teaching knowledge, or the orientation towards a more student-oriented or a more teacher-centered teaching approach. Therefore, we carried out a study with 81 university teachers at a German university to analyze the relevance of teaching experience for the shift from teaching to learning as a dimension of a successful SOTL. The presentation will focus on the theoretical background, design, and results of this study indicating that teaching experience seems to be an inhibitor for the shift from teaching to learning in the context of SOTL.

Student-teacher relationship at university: an important yet under-researched field
The aim of this paper is to review previous research on the relationship between students and teachers in higher education across three main areas: the nature of this relationship, its consequences for students and teachers, and its development through interactions. Given, that human beings are driven by the need to belong (‘belongingness hypothesis’), it can be assumed that both students and teachers at university strive to establish satisfying bonds, which are expected to impact positively on the individual and on the quality of teaching and learning in higher education (e.g. student motivation, student retention, teaching satisfaction). Thus, establishing positive relationships between teachers and students in HE can be regarded as one aspect of Scholarship of Teaching and Learning (SOTL). However, while school research already acknowledges the relevance of relationships between students and teachers for successful school learning and teaching, higher education research has neglected this research agenda so far. Consequently, the development of integrated conceptual frameworks on the student-teacher relationship in higher education, are still lacking, which has led to diverse operationalizations of this construct that preclude meaningful comparative analysis. The focus of the presentation is on conceptual issues, but methodological aspects identified through the review are also addressed. The paper will highlight the weaknesses and gaps in prior research, and the importance of addressing the multidimensional and context-bound nature of student-teacher relationships. The paper will include the presentation of a heuristic framework from which an agenda for future research can be developed.

The role of literacy skills in mathematics learning

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Switzerland

Lieven Verschaffel
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Research literature agrees that literacy skills play a considerable role in mathematics learning. Thus, mathematical tasks with high demands on literacy skills are a challenge to students with low literacy skills. The aim of the symposium is to provide new insights into the role of language skills for learning and assessment of mathematics skills and how mathematics learning of students with low literacy skills can be supported. Piia Björn, University of Jyväskylä, Finland, investigates the extent to which basic literacy skills and calculation skills predict mathematical word problem solving skills three and five years later. Stefan Ufer, University of Munich, Germany, reports on a longitudinal study focusing the effects of language skills and socio-economic background on the development of mathematics skills in monolingual and bilingual students. Caroline Villiger, University of Teacher Education Freiburg, Switzerland, reports on an intervention study on cooperative learning in mathematics with tasks requiring literacy skills. Nicole
Haag, Humboldt University Berlin, Germany, investigates the issue of second language learners and assessment of mathematics achievement. The role of linguistic simplifications of test items will be analysed. Finally, Lieven Verschaffel, University of Leuven, Netherlands, completes the symposium by discussing the scientific and educational relevance and implications of the presentations.

**Literacy Skills and Calculation Ability Predict Math Word Problem Solving Skills in Adolescence**

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This study aimed to investigate the extent to which basic literacy skills and calculation skills predict the mathematical word problem solving skills later on. The participants of this five-year longitudinal study were 225 nine to ten years old children (Grade 4) at the baseline. The children’s text reading fluency, reading comprehension and basic calculation ability were first tested (Grade 4). Three and five school years later (Grades 7 and 9), their skills in solving mathematical word problems were assessed. The results showed that performance in reading comprehension at the fourth grade strongly predicted math word problem solving skills on both grades (7 and 9). Reading comprehension and reading fluency together with good basic calculation skills predicted good math word problem skills. However, reading fluency did not directly predict math word problem solving skills. There were no gender differences in math word problem solving skills, but the girls were better in reading fluency and in reading comprehension. Additionally, the girls’ reading comprehension skills at grade 4 predicted math word problem solving skills in the ninth grade. The educational implications of the results are discussed.

**Language skills, social background and migration – Effects on mathematics skills**

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Low mathematics skills of children from migrant families in Germany have been documented by survey studies in the past. Children from migrant families usually grow up in a bilingual environment, with a non-German language used in the family. Positive as well as negative effects of bilinguality on cognitive skills have been demonstrated in the past. When mathematics skills of migrant children are studied, these skills are usually operationalized as a one-dimensional construct. Results on the effects of bilinguality as well as ideas from mathematics education support the hypothesis that this is not adequate. We report on a longitudinal study with N=417 elementary school students. We analyzed the influence of bilinguality, language skills, and other control variables on two different facets of mathematics skills and their development during one school year. In particular we find no disadvantages of bilingual children at the end of grade 1 with respect to demands that can be solved by schematic procedures. With respect to tasks that require conceptual understanding, we find significant disadvantages that can be explained by skills in the language of instruction. Similar results arise for learning gain during one school year. The implications of these results with respect to possible domain-specific language support for students with non-German family language are discussed.

Student Teams-Achievement Divisions (STAD) in Mathematics: The Role of Reading Comprehension

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This presentation reports on the implementation of a Student Teams-Achievement Divisions (STAD) Program on academic achievement in mathematics. The students worked on tasks that required gathering information from texts, graphs, and tables. Therefore, we investigated the influence of reading comprehension on the learning outcome after controlling for prior knowledge and nonverbal cognitive abilities. Among others, gender, family background (ISEI, first language) and quality of teaching were used as control variables. 30 classes with a total of 519 fifth graders participated in the project. Teachers of the intervention group got training at three half-days. Effects of the treatment condition were investigated with a pretest-posttest control group design, including a follow-up assessment 5 months later. Multilevel analyses revealed that students of the intervention group reached significantly higher test scores in math than the control group. Reading comprehension appeared to be an important predictor of math achievement. The results show that literacy skills must be considered when implementing programs such like this.

Revisiting the Relevance of Academic Language in the Assessment of Mathematical Competence

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Birgit Heppt
In previous large-scale assessment studies, second language learners consistently obtained lower test scores in mathematics than native speakers. While this performance difference was related to the linguistic complexity of test items in some studies, other studies did not find evidence for the hypothesis that linguistically demanding math items are disproportionally more difficult for second language learners than for native speakers. Furthermore, previous studies investigating the effectiveness of linguistic simplification of test items seem to have yielded inconsistent results. Based on these findings, we investigated the role of linguistic simplifications of mathematics test items with a specific focus on the academic language features included in the items. Specifically, we investigated in a large-scale linguistic simplification study whether a performance gap between second language learners and native speakers can be explained by their respective language proficiency and whether performance differences are smaller in linguistically simplified items. 13,048 fourth graders participated in the study, of which 1,792 primarily spoke a language other than German at home. While differences between second language learners and native speakers in mathematical achievement were related to differences in their language proficiencies, we found no significant effects of linguistic simplification. This indicates that the disadvantage of second language learners is not primarily in the testing situation.

Metacognitive strategy knowledge - How it can be assessed and how it relates to achievement.

Self-regulated learning is viewed as highly important to flexibly cope with the changing learning demands and to enable live-long learning. Metacognitive strategy knowledge and especially the higher order relational strategy knowledge, constitutes a central prerequisite for successful self-regulated learning (Borkowski, Chan, & Muthukrishna, 2000). The efficacy of learning strategies varies with task demands and learning contexts. Relational metacognitive strategy knowledge encompasses knowledge regarding the conditions of a strategies use as well as the effectiveness of a strategy in relation to others. As such it enables a situation appropriate choice of the most beneficial
strategy. Inspired by findings of the PISA study on strategy knowledge different tests have been developed to assess this kind of strategy knowledge with students of different age groups and across different domains. The symposium combines research findings regarding the assessment of this knowledge component and addresses its school related achievement measures. Borkowski, J. G., Chan, L. K. S., & Muthukrishna, N. (2000). A process-oriented model of metacognition: Links between motivation and executive functioning. In G. Schraw & J. C. Impara (Eds.), Issues in the measurement of metacognition (pp. 1-42). Lincoln, NE: Buros Institute of Mental Measurements.

Metacognitive Knowledge in Students with Special Educational Needs

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Among other factors, metacognition is supposed to play an important role in the emergence of learning difficulties in students with special educational needs (SEN). The assessment of metacognitive knowledge in this group of students is particularly challenging. Hence, assessment methods rely on other abilities, particularly on reading abilities that are supposed to be low in students with SEN. The present study was realized to investigate if and how metacognitive knowledge can be validly assessed in students with SEN in a longitudinal study like the German National Educational Panel Study (NEPS). The study investigated assessment features by two conditions that varied in terms of the administration mode: autonomous reading as in regular test settings and a read-aloud condition. The sample of the study consisted of both regular-school students and students with SEN in the area of learning (SEN-L): About 450 sixth-grade students attending special schools and about 600 sixth-grade students of the lowest high-school track (serving as a control group) participated in the study. Students’ metacognitive knowledge was measured by a scenario-based test focusing primarily on different aspects of strategy knowledge. Moreover, reading speed, verbal and nonverbal cognitive abilities were assessed to gather more detailed information about the circumstances under which students are able to perform the metacognitive knowledge test in the two different administration modes. The results of the study are discussed with regard to assessment-relevant approaches as well as pedagogical implications.

The Relation between Metacognitive Knowledge, Motivation, and Grades

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This study investigates the relation between students’ metacognitive knowledge, motivation and achievement. Considerable research evidence indicates that these constructs are related to each other, yet there is still insufficient understanding of the causal structure of their relation. Tenth- and eleventh-grade students’ (N = 1536) from Swiss baccalaureate Schools responded on the one hand to a newly developed test measuring students’ knowledge about the strategies that they use to accomplish complex and difficult assignments and projects at school. On the other hand they responded to questionnaire items designed to assess motivation and school achievement. Cross-lagged analysis found substantial correlation between all variables. But neither metacognitive knowledge nor motivation did predict each other. The results support bidirectional effects between motivation and achievement.

The Interaction between Relational Strategy Knowledge, Goal Orientation, and Performance

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Learning strategies are important tools to improve performance. To gain the most from the application of strategies, they have to be chosen in such a way that they are situation-appropriate as well as efficient. Conditional strategy knowledge on ‘when’ to apply a certain strategy and subsequent relational strategy knowledge on when to apply ‘which’ strategy - compared to other appropriate strategies - is required in order to make optimal choices. The strategy-related knowledge develops in conjunction with domain-related learning activities, including the repeated and successful use of strategies across various learning tasks. Students’ goal orientations are related to performance, too. Students with a learning-orientation are process-oriented and aim to improve their learning. Students with an achievement orientation are outcome-oriented. Learning orientation influences learning behaviors such as the quantity and quality of strategy use. Therefore, they are supposed to effect the development of strategy-related knowledge as well. Our findings indicate that learning orientation positively affects strategy knowledge and performance in the familiar domain of reading, but not in the novel domain of English as a foreign language. Performance orientation negatively affects strategy knowledge and performance in both domains.
Reading strategies of biliterate students in first and second language reading comprehension

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This study looked at the components of reading comprehension in the first (German) and second (French) acquired language at school including metacognitive, motivational, socio-economic and linguistic factors. The Luxembourgish educational system and the linguistically heterogeneous population contribute to a complicated multilingual setting. Reading skills are acquired in German (grade 1) and French classes start from grade 3 on. Luxembourgish remains mostly spoken together with many other (mostly Romance) languages due to the high percentage of foreign population. About 6400 adolescents attending grade 9 completed two standardized reading comprehension tests and questions on efficient reading strategies in both German and French. Further, we collected information on background variables such as native language, socio-economic status and motivational aspects in relation to both languages. All the data were collected via a computer-based testing platform. Multiple regression analyses showed that the best predictors for German reading comprehension were German metacognitive knowledge, socio-economic background and self-concept in German. The best predictors for French reading comprehension were French metacognitive knowledge, self-concept in French, socio-economic background and a Romance language background. A Germanic language background is not a good predictor for German reading comprehension, whereas Romance language background is a good predictor for French reading comprehension. These results suggest that 9 years of German language classes, eliminates the advantage of having a Germanic language background for German reading comprehension. Students with a Romance language background have an advantage in French reading comprehension.

Errors, emotions and their relevance for professional learning

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Andreas Rausch
This session aims at providing theoretical concepts and empirical evidence for emotional work conditions which support or inhibit learning from errors in the context of daily working life. The contributions comprise empirical studies investigating different aspects of learning from errors in order to analyze the broad scope of this issue. By discussing strategies of detecting errors, knowledge resulting from error experiences, competence of dealing with errors and individual beliefs influencing the way of dealing with errors, this symposium provides a comprehensive examination of an unavoidable aspect of daily working life: Human fallability.

**Mistakes and entrepreneurial failure**

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Fritz Oser  
Universitat Freiburg  
Switzerland  

This presentation sketches first results of a study on applied educational psychology: mistakes in the field of entrepreneurial endeavor. In 2011 39,665 start-ups in Switzerland were founded. Unfortunately more than 6536 showed central weaknesses, did profound mistakes and went bankrupt. Every second fails within the first 5 years! The goal is to generate knowledge about mistakes and failure of young entrepreneurs. For this a concept called ‘sense of failure’ that should serve to set up a ‘protective belt’ against frivolous crashes was developed. On one hand, it has already been developed by every young founder, and on the other hand must systematically be trained (intervention). The question of how much failure a young entrepreneur can bear despite the dangers of setting up a firm is not yet clear. This ‘sense of failure’ should be faced comparatively to the ‘sense of success’, the counter construct. Method: To record the construct ‘sense of failure’, semi-structured interviews with 8 failed, 8 successful entrepreneurs and 8 not founding interested persons from the similar working-field (matching) will be conducted to make systematic comparisons on following criteria: risk propensity, responsibility, overconfidence avoidance, awareness for weaknesses and pitfalls, intuition about mistakes, escape heuristics etc. From these results we will develop a dimensioned questionnaire serving for a larger study on entrepreneurial mistakes. We hypothesize that successful entrepreneurs have a high sense of failure, non-successful entrepreneurs do not have enough or partial sense or failure.

**Emotional reactions on error situation at the workplace and their relevance for the learning process**

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This contribution provides insights on employees’ emotional reactions in error situations at the workplace and their impact on the learning process from errors. Error situations bear certain opportunities for experience based reflection and learning processes. Error situations can be defined as goal-incongruent events when a certain goal could not be attained by the affected employee. Particularly, this goal-incongruence is supposed to evoke strong negative emotions (Weiss & Cropanzano 1996). The learning processes triggered by an employee’s failure are influenced by this emotional reaction. The emotional effect on error learning could be influenced by individual characteristics as well as by the social environment. Due to an empirical gap this research will cast light on the relationship between learning from errors and emotions by having a particular view on what social and individual variables affect emotions and the impact of emotions on learning from error processes.

Supervising trainees in general practice: Analysis of tutorial dialogues on diagnostic reasoning

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In the professional training of general practitioners, trainees work largely independently. They mostly see patients alone and consult with their supervisors on a regular basis to discuss patients and problems, receive feedback, and improve on their competences. Both the quality of care and the quality of training, thus, depend on these interactions between a supervisor and a trainee that we refer to as tutorial dialogues. In the present study we analyzed the content of 18 tutorial dialogues in general practice training that focused on diagnostic reasoning to examine their learning potential. From a self-regulated learning perspective we may conclude that the tutorial dialogues might be more effective if learning goals were more clearly set and evaluated. This also implies that reasons for discussing a case could be better explicated. However, there was substantial constructive and reflective activity during the dialogues that might have promoted the acquisition of diagnostic competence of trainees. The trainees were also more active during the discussions than the supervisors. We found that uncertainty, a sense of alarm and errors elicited meaningful discussions to discuss diagnostic reasoning. This study shed light on the tutoring processes in supervision of trainees that work independently on the job. The perspectives we took were useful in analyzing the quality of the tutoring dialogues and can also be applied in other workplace learning settings.

Errors in the workplace – An empirical study in the hotel and restaurant sector

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As work is usually too complex to completely eliminate the potential for errors, dealing with errors in the workplace is an important strategy for workplace learning (Bauer & Harteis, 2012). Moreover, some empirical evidence shows a positive relationship between error culture and firm performance (van Dyck, Frese, Baer, & Sonnentag, 2005). But making an error is frequently experienced as
something negative and emotionally stressful. This attitude often prevents errors from being received as learning opportunities. Our studies deal with two research questions: (1) Study 1: How do trainers in the workplace deal with errors? We assume that the quality of feedback should have an impact in order to foster learning processes in error situations. (2) Study 2: Furthermore, little is known about how individuals deal with errors with regard to contextual variables, i.e. error climate. We assume that the error climate is an important predictor of apprentices’ dealing with errors.

**Supporting Deep Learning from Multiple External Representations**

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External representations are universal educational tools: flow diagrams are used in programming, schemas and diagrams in biology, graphs in mathematics. Typically, instructional materials use multiple external representations (MERs), because different representation can emphasize unique key aspects of the learning content. The educational psychology literature supports this practice: there is strong evidence that MERs can significantly improve students’ deep learning of domain knowledge. However, to benefit from MERs, students need to be supported in understanding each individual representation as well as in making connections between the different representations. The question of how to best support learning with MERs is not trivial: since support for learning with MERs can be provided in many different ways, the design space in which current research is taking place is very large. The goal of this symposium is to integrate research on instructional support for learning with MERs that is being conducted in a variety of domains and from a wide range of theoretical perspectives. We will discuss lessons learned and open challenges in this vibrant area of research. Rau et al. investigate the complementary role of different types of support for connection making between multiple graphical representations. Geiger et al. evaluate the effects of training skills involved in learning with MERs. Mengelkamp et al. investigate interactions between verbal intelligence and learning from interactive and non-interactive animations. Bodemer discusses results from experiments that investigate support for connecting multiple representations in individual and collaborative settings on students’ learning from science exhibitions.

**Support for Sense Making and Fluency in Learning with Multiple Representations**

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Previous research demonstrates that multiple representations can enhance students’ learning. However, research also shows students learn deeply from multiple representations only if the learning environment supports students in making connections between the representations. We hypothesized that connection-making support is most effective if it helps students both in making sense of the content across representations and in developing fluency in making connections between representations. We tested this hypothesis in an in vivo experiment with 598 4th- and 5th-grade students using an intelligent tutoring system for fractions. We manipulated two factors: support for sense-making processes (none, auto-linked problems, or worked examples) and support for fluency-building processes (present/absent). In addition, we included a single-representation control condition. We assessed students’ conceptual and procedural knowledge prior to, after, and one week after the intervention. Results confirm our main hypothesis for conceptual knowledge: neither type of connection-making support alone was effective, but there was a significant interaction between sense-making support and fluency-building support on conceptual, such that a combination of worked examples and fluency support lead to the highest learning gains. There was no effect of either type of connection-making support for procedural knowledge. Finally, the condition that learned with a combination of worked examples and fluency-building problems significantly outperformed the control condition. We conclude that combining different types of connection-making support is crucial in promoting students’ deep learning from multiple representations.

How to get better in performing mathematical tasks: A training programme

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Representations became more and more important over the last few years. Due to this students need skills to read information off a representation as well as to combine them or to produce a representation on their own. Many studies show that students have problems with these tasks but hardly any research has been conducted to identify how to improve this situation. Therefore we developed a special training to show students (n = 46) strategies to produce, combine, read out and transform representations. The control group (n = 17) learned how to cope with stress. A third group of students (n = 30) also took part in the survey, without any training. In the pre- and post-test learners had to work on 36 tasks in the mathematical domain of linear functions, in which representations had to be produced, integrated as well as transformed into another format. Results of this study indicate that students benefited from the training with respect to reception, integration and transformation skills, but not concerning production of representations. Since our pre-study showed that learners benefit from training on production we have to extend the training on production.

Self-paced learning from animations: An effect of reduced cognitive load or of self-regulation?

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The aim of this study was to test two explanations of the interactivity principle in multimedia learning. Accordingly learning from a self-paced animation should be more effective than learning from a system-paced animation. Two explanations can be given for this effect: (1) The reduction of evanescence of information and cognitive load in general, and (2) the fit of information to the current needs of the individual learner. If the first explanation is true it will not matter who is in control of the animation, that is, even a passive co-viewer will profit from the reduction of evanescence and cognitive load. But if the second explanation is true it will matter if participants control the animation themselves. To test these explanations participants learnt either from a system-paced or a self-paced animation about the functioning of a chemical synapse. Additionally we recorded the screen in the self-paced group and presented these recordings to the participants of a third group to ensure that they got exactly the same information but were not able to control the presentation themselves. Results showed no differences between groups in learning outcome, cognitive load, or mood but we found an interaction effect using groups and an indicator of verbal intelligence as predictors and learning outcome as the dependent variable. So we found an effect of self-paced learning at least for participants who were high in verbal intelligence but further research is needed to explain this effect.

Individual and Collaborative Learning in Science Exhibitions: Connecting Multiple Representations

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Learning in museums is learning with multiple external representations: authentic objects are commonly accompanied by context information that complements or explains them. Research has shown that understanding different representations and systematically translating between them is challenging but can be facilitated. Two experiments are reported that investigate whether positive learning effects of a multimedia integration task can be applied to individual learning (Experiment 1) and collaborative learning (Experiment 2) in a science exhibition about nanotechnology. Several features of this task are promising for learning in museums, such as implicit guidance mechanisms, its puzzle-like character and the possibility to deal with it collaboratively. Corresponding to results in traditional multimedia settings, it revealed that the integration task could beneficially support translating between representations compared to presenting pre-integrated or non-integrated information. Retention was not facilitated in the same way. Enhancing traditional multimedia results, it showed in addition that the task directed the visitors’ attention implicitly to related exhibits and initiated taking extra ways between exhibits and context information.
The engineering context represents a paradox for motivation researchers. Enrollments in undergraduate engineering courses are characterized by high levels of attrition, despite the fact that engineering course work is anchored in practice and, as such, should enable learners to make the kinds of connections to real world contexts and previous experiences that result in study engagement, instrumentality or the expectation that work will yield study outcomes, self-efficacy, and interest. Why is it that students who enroll in engineering are not choosing to continue in the field? The role of motivation in the learning of engineering content has only begun to be investigated. The present symposium brings together researchers who draw on different theoretical traditions to consider motivation for learning engineering. Each presenter will briefly review current work and use it as the basis for addressing the following questions: How is their study of motivation for learning engineering conceptualized and operationalized? What parameters are important for understanding the nature of the relations identified? What questions do motivational data of this type answer, and raise, for understanding motivation for learning engineering more generally? What are the implications for practice? Following the presentations, the discussant will involve the presenters and members of the audience in thinking together about session questions and how the different approaches to the study of motivation for learning engineering together describe both what we presently know and what we still need to figure out.

The effect of course content on motivation for required courses in engineering

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Glenda Stump
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This study examined differences in engineering students’ endogenous and exogenous instrumentality for required courses within the engineering curriculum. The results indicated that engineering students had higher endogenous instrumentality than exogenous instrumentality for required engineering courses, and that they had higher endogenous instrumentality for their engineering courses than their other required courses. Additionally, endogenous perceptions of instrumentality
(PI) was a significant predictor of students’ engagement in knowledge-building behaviors to learn course content for both engineering and math courses, while exogenous PI was a significant negative predictor of knowledge building behaviors in engineering courses. Fostering engineering students’ perceptions of endogenous instrumentality for their coursework may be key to their strategic self-regulation for learning course material.

**Epistemological beliefs, motivational strategies, and study engagement in engineering education**

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Kirsti Lonka  
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Finland

This study was designed to investigate what promotes study engagement in engineering education. Participants were engineering students (N = 224) in a technical university who completed a questionnaire before the course. The data were collected from six traditional courses for engineering students. The questionnaire measured study engagement, motivational strategies, and epistemological beliefs. Statistical analyses consisted of bivariate correlations and stepwise regression analyses. Findings confirm previous studies in other disciplines. Reflective learning (epistemology) and optimism (strategy) were positively related to study engagement, whereas task avoidance (strategy) was negatively related. These three variables explained 23% of study engagement, suggesting that they contribute significantly to student motivation for learning in engineering courses.

**The roles of interest and self-concept of ability in students’ perceptions of engineering pedagogy**

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Caroline Sacko  
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Danielle Miller  
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A two-part, use-inspired, mixed-method investigation was undertaken in order to address engineering faculty members’ questions about their students’ pedagogical needs, especially the needs of students who decide not to continue to pursue engineering. The roles of students’ interest in engineering and their self-concept of ability (SCA) for engineering were explored as influences on motivation for learning in engineering. Findings indicate that students differ in their phase of interest and their SCA, although it is phase of interest that appears to predict who will continue to pursue engineering. Those with less-developed interest were likely to have either high or low SCA, whereas those with more-developed interest had high SCA. Findings further suggest that students in engineering who are in earlier phases of interest for engineering are more likely than those with more-developed interest to need the environment (e.g. professors) to assist them in making connections to available resources, forms of instruction, and advising that they do not yet engage independently.
Retaining female engineers: Lessons from our students

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Despite a recent emphasis on increasing female retention in engineering, data trends indicate that efforts have shown limited success. Therefore, we suggest that research exploring the interest of women who chose engineering as a career path is essential. This study attempts to consider female retention in engineering by studying students who have stayed in the field. Primarily we are interested in understanding why they choose engineering and why they stayed. Interviews were conducted with six female engineering students attending a summer research program. Using a post-paradigm constructivist method, we extracted themes relating students’ perceptions of their engineering success to theoretical constructs. Although we recognize the diversity of female engineering students and the limitations of our small sample, commonalities emerged that contribute to the understanding of experiences of women who persist in the industry. This research contributes to scholarship addressing recruitment and retention of female engineers.

Assessing Digital Competence in National and International Contexts

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Digital competence (or digital literacy) is now regarded as essential to young people’s learning and their capacity to participate in 21st Century society. Consequently there have been increasing efforts, such as those recently sponsored by the European Commission, to conceptualize and measure aspects of digital competence (Janssen & Stoyanov, 2012). This symposium brings together four papers that contribute to an understanding of how digital competence can be assessed consistently across countries, within countries and over time. The symposium explores the constituent elements of digital learning and enunciates how they can be meaningfully measured, described and reported. It is based on a set of large-scale assessment in which digital competence has been reliably measured in different contexts. The papers demonstrate how studies focusing on different aspects of digital competence can contribute to understanding the nature of student digital learning and how digital competence achievement varies among individuals and across countries as well as over time. It explores the contribution of student characteristics and dispositions to the development of digital
competence as well as issues involved the measurement of digital competence in different countries, at different stages of schooling and changes in digital competence over time. It also considers the technical and methodological aspects of assessing of digital competence.

Assessing Computer and Information Literacy across 20 Countries

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The IEA International Computer and Information Literacy Study (ICILS) assesses Computer and Information Literacy (CIL) among Grade 8 students within and across 20 countries. Computer and Information Literacy is defined as the ability to use computers to investigate, create and communicate in order to participate effectively at home, at school, in the workplace and in the community and reflects many of the characteristics of ICT and digital literacy constructs found in the literature. ICILS developed an assessment of computer and information literacy and conducted a field trial with approximately 8,900 Grade 8 students from 500 schools in 20 countries. The assessment instrument proved to have sound psychometric properties and computer and information literacy could be interpreted in terms of a progress map based on the tasks that students could complete successfully. The assessment functioned in an equivalent way in the 20 participating countries. The paper uses data from this field trial to define the construct being assessed. It also reports on the association between computer and information literacy and student characteristics.

Digital inclusion at 4th grade: Are fourth-grade students meeting the curriculum goals?

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A recent test of digital competence among 4,894 Norwegian fourth-grade students is analysed in order to explore if stated policy targets of digital and overall inclusion are met. The test is closely aligned to the curriculum and focuses on operational aspects of digital competence, such as multiple choice, hot spot, and drag-and-drop tasks. The students completed 73 tasks, and a Cronbach’s alpha of 0.92 indicated good internal consistency. The aim of the paper is to examine factors explaining differences in students’ digital competence. The factors of motivation, family background, and gender are entered in a multi-level model where the initial variance attributed to differences between schools decreases significantly with the inclusion of these individual background variables. The findings corroborate other studies in attributing students’ digital competence to socio-economic background factors. These findings are contrary to the stated policy goals and point to areas of future efforts, including better measurements of digital competences and structured feedback for teachers on how to guide students into better learning processes with ICT.
Assessing ICT Literacy among Australian students: Patterns and changes over six years

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This paper reports on a computer-based assessment of ICT Literacy in Australia conducted among Grade 6 and Grade 10 students over six years from 2005 to 2011, methods for equating those assessments and measuring change over the period. ICT Literacy is seen as a set of generalisable and transferable knowledge, skills and understandings concerned with the use of computer technology to investigate, create and communicate information in a variety of contexts. The assessments combined the performance of specific software functions with the creation of digital products. IRT methods were used to analyse the student responses and generate a scale for locating items from each module and reporting student achievement. The scale was one-dimensional, highly reliable (0.93), and was characterised by descriptions of proficiency levels based on item difficulties. Common tasks were used to compare the relative performance of the Grade 6 and Grade 10 students and other common tasks were used to link the 2011 results to those from 2008 and 2005. The comparisons of achievement over time in a rapidly developing field were made possible through instruments that reflect relevant technological changes and maintained integrity to the core processes of the ICT Literacy construct. The results show an improvement in the ICT literacy among Grade 6 students but no change for Grade 10 students. In addition the results indicate that ICT literacy is related to student perceptions of ICT and their socioeconomic background.

A Comparison of Approaches to Data Collection in Two Large-Scale Computer-based Surveys

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A fundamental principle of assessment is that all respondents should experience the tasks in an identical manner. Uniformity of presentation is assured in a printed test but computer-based assessment can impact upon student performance because of variations in presentation. Key requirements for delivery technologies are that they provide the basis for the assessment to be presented with integrity are efficient in the demands placed on resources and are effective in capturing student response data for subsequent analysis. These issues are especially an issue for internet or web-based delivery of assessments and complex tasks (such as those involving multimedia applications) place greater demands on delivery methods than stimulus material and multiple choice response options. Assessments delivered in schools are dependent on the co-location and capacity of computer (including adequate memory, graphic capacity, screen size and screen resolution), the operating system and the availability of software plug-ins, as well as bandwidth and the number of students using school computer resources concurrently and school or system level security arrangements. The ICILS field trial provides evidence about the implementation of computer-based assessments in approximately 500 schools from 20 countries and PIAAC collected data from, on average, 5,000 individuals between the ages of 16 and 65 in each of the 24
participating countries. These two different studies provide important perspectives on computer-based assessment in different contexts.

Supporting Reflection in Vocational Educational and Training

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When it comes to learning from experience, the most influential learning theories, from John Dewey, to David Boud, David Kolb, Donald Schön, and Yrjö Engeström, agree on the fact that experience per se is not enough: for learning you need to reflect on your experience. In particular in vocational education, active reflecting on experiences and on differences and similarities between such experiences is inherent to that interplay between cognitive, affective and social processes which generates learning. The first contribution to the symposium is based on the idea that errors are important occasions for reflection at work. More specifically, it investigates how the attitude of a person towards errors is related to the quality of reflection. However, reflection generally does not occur spontaneously: apprentices often don’t reflect on their experiences, so not combining theory and practice and need to be stimulated to explicate their experiences. Therefore, the remaining three contributions to the symposium present different ways to support reflection by means of technology: the first approach is picture-based reflection of baker apprentices in an online learning journal including reflective prompts, the second is collaborative reflective activities on content of a learning journal, for cook apprentices and the third is a newly-developed smartphone app for registering learning moments during work for resident physicians. The results show the impact of the technology support on the type and level of reflection, meta-cognitive competence, feedback-seeking behavior, and/or exam performance.

Error Orientation and Reflection at Work

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Reflection on events at work, including errors is a means to learn effectively through work. However, little is known about whether attitudes towards errors influence reflection at work. In a cross-sectional field study in the banking sector, we investigated various attitudes towards workplace errors (i.e. facets of error orientation) as predictors of reflective activity. We assumed the perceived working climate (i.e. psychological safety) to have a mediating effect. The study participants were 84 client advisors from the retail banking departments in branches of a German bank. Regression analyses revealed that error competence and learning from errors were significant predictors of reflection. Furthermore, the results confirmed the mediating role of psychological safety on the association between attitudes towards errors and reflection. We argue that our results inspire future research e.g. on the interrelation between different types of errors (lapses vs. knowledge based errors) and the extent and nature of reflective activities. Key words: Error orientation - Psychological safety - Reflection - Retail banking - Workplace change

Can online learning journals boost the use of learning strategies?

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In Vocational Education and Training reflecting on one’s experiences at the workplace is fundamental but neither time to reflect nor colleagues to discuss with are generally present directly after completing a task. Learners are expected to develop learning strategies and to regulate their cognitions by themselves. A Mobile and Online Tool (MOT) was therefore developed to store workplace experiences on the fly and to stimulate the use of learning strategies and reflection on these experiences later on by reacting to various prompts. 15 apprentices from the bakery sector used this tool freely during two years with the mission to realize their recipe book and to document their learning progress in a learning journal. The content of their recipe books and of their learning journals was analyzed and every mention of a given learning strategy (based on McKeachie, 1987) was computed and reported to the learners’ marks at the final examination of their training. Results confirm the positive impact of such a tool on the use of learning strategies. Significant positive correlations were found between the use of the MOT (number of self-evaluations, number of prompted reflections and number of summaries written) and the final exam’s grades. Final grades were also positively and significantly correlated with the frequency and the variety of the learning strategies employed in apprentices’ learning journals, as well as with the variety of the levels of operations on which apprentices’ reflections are focused.

Capturing Workplace Experiences for the Development of Shared Metacognition with Apprentice Cooks

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In Vocational Education and Training (VET), apprentices experience multiple learning contexts. Using technology as a means to capture professional situations lived at the workplace can help apprentices to reflect at school - through fitting activities - on what they live at the workplace and vice versa, connecting the two learning places. Given the assumption that ePortfolio can be an instructional tool to promote and support metacognition, the present work aims to see the effects of specifically designed individual and shared metacognitive learning activities on apprentices’ metacognitive development in two classes which respectively use an electronic Portfolio and a traditional paper-pencil one. We designed a longitudinal study, involving apprentice cooks (n=45) and their teacher of 'professional knowledge'. Each apprentice in the experimental group (n=22) was given an iPhone to collect meaningful pictures at the workplace and also an e-portfolio, where to write recipes documented by the collected pictures and where to fill in the so-called ‘Weekly Report’ with reflections on her/his practice. First results show that a portfolio is an effective means to foster metacognition, with no relevant added value for its being electronic rather than paper-pencil, and that our activities, appreciated by apprentices, had a significant positive effects on the presence of metacognitive elements in the written productions collected in the electronic portfolios.

The Smartphone as a Mobile Reflection Tool for Learning at the Workplace

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Learning at the workplace is ever more important in training of professionals. Learning should take place at unexpected, informal moments during work. These learning moments should be used for reflection, but before they should be recognised and remembered which is not evident in the hectic of work. The current study aims to improve saving learning moments by introducing a newly developed smartphone app with which moments can be easily registered during work. We will answer the question whether this leads to higher readiness to reflection and deeper forms of reflection, compared to their usual way of dealing with unexpected moments during work. Participants in this randomised experiment were 33 residents (i.e., medical doctors in training), assigned to (1) a condition in which they used an app for registering learning moments as short texts,
voice recordings, pictures or video’s, or (2) a control condition (registering learning moments in their usual way). Questionnaires were used to measure nature of reflective practice, willingness to reflection, and feedback seeking behaviour. Additionally, individual interviews were conducted. Results showed that the app stimulated awareness of learning moments. Content of registered moments ranged from emotional experiences, lack of knowledge, topics to discuss with the supervisor, and input for their portfolio. Some residents called the app a mini portfolio. Increased awareness of learning moments in the experimental condition went together with deeper reflection. It is concluded that reflection at the workplace can be stimulated with mobile technology. ‘Reflection app’ is a useful application for supporting informal learning.

Facilitation of students’ learning processes in computer-supported learning activities

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From an early age and in keeping with societal and technological changes, today’s students are exposed to collaborative tasks and complex multidisciplinary problems in ‘new’ forms of technology supported learning environments. These technology environments may vary in form and design, but are often used in combination with collaborative learning activities, multidisciplinary inquiry challenges, project work or role plays. Furthermore, students are often expected to find and integrate relevant information from multiple, multimodal sources embedded in the computer-environments or the Internet. Research on students’ learning, in technology-supported environments within various knowledge fields and on different educational levels, shows that students’ domain-specific knowledge and procedural skills increases. Yet, studies also reveal that students have problems finding and interpreting relevant data and/or information, critically evaluating information sources, connecting and bridging activities, and managing collaboration. Within the research field there is general consensus about the importance of focusing on how various types of social, technological or structural efforts of facilitation can enhance students’ conceptual learning in technology based learning settings. This symposium joins on-going research focusing on various forms of facilitation of students’ learning processes in technology-based learning environments. The papers all report studies focusing on facilitation in forms of teacher intervention, scripts, digital representational tools, and digital support tools designed for procedural inquiry support. By providing results from studies with socio-constructivistic and socio-cultural approaches, this symposium aims at providing insight into the impact of facilitation on both individual and group levels.

Conceptually oriented student-teacher interaction in the setting of computer-supported inquiry

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This paper reports on a study of student-teacher interaction in computer-supported inquiry settings. Studies within this field have provided valuable knowledge about how various forms of computer-based tools support students’ conceptual and procedural achievements. Less research however, is undertaken in order to understand the relevance of teacher intervention in computer-supported learning settings. Studies focusing on teacher intervention show divergent findings. A frequent finding is the importance of teacher intervention for students’ development of conceptual understanding. Nevertheless, studies also show that teachers often tend to become administrative facilitators in these types of settings. The current study aims to contribute to this body of research by providing deeper insight into the role of student-teacher interaction for students’ conceptual sense-making in computer-supported inquiry settings. Detailed analyses of student-teacher interaction in a setting where secondary-school students engage with computer-supported inquiry learning within the field forensic-medicine constitute the empirical basis for the study. Findings demonstrate the importance of teacher intervention for students’ conceptual sense-making, validating and contextualizing their activities and ideas, resulting in that students became improvitngly capable of seeing the relevance of their inquiry and findings. Secondly, the computer-environment functioned as a shared starting point for conceptually oriented talk, as well as being a resource for the students in order to communicate their findings and reflections to the teacher.

Facilitating students’ sense-making in modern history through a computer-supported note-sharing tool

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This paper reports on an intervention study on facilitation of students’ joint sense-making in computer-supported classroom discussion in the setting of a modern history class. The focus of the study is the use of a note-sharing tool designed to bridge classroom activities such as teacher lectures, computer-based individual work, small group activities and class discussion. The tool was designed with two aims in mind: to sustain and display arguments as a basis for joint sense-making, and as a bridge between various learning activities. The data consists of video-recorded classroom interaction, students’ written work, and pre- and post-tests collected from a Norwegian senior high school. The students (N=25) worked on the topic of democratic development and the role of ideologies in Europe prior to the First World War era. We used the increase from pre- to post-test to chart the students’ trajectories of participation across classroom activities. We found large variations in results among students, especially with regard to what they gained from computer-based individual work, but also with regard to what they gained from participation in collective arenas. Despite these differences, our analysis shows that all students benefitted from the computer-supported collective discussions.

Interactional features of collaborative learning in virtual learning spaces

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Sanna Jarvela
Skills for collaborative learning are widely needed in today’s education and working life. Social interaction is the prerequisite for successful collaboration, and earlier studies have indicated the benefits of pedagogical scripts in promoting interaction between learners. Although much is known about interactional features of collaborative learning and the effects of scripts, there is a lack of research implemented in an authentic learning context. The aim of this study is to explore 1) how collaborative scripts affect students’ participation and course grades and 2) what kinds of interactional processes occurred in students’ collaboration while they were working in small groups in virtual learning spaces. The data was collected from a higher education course called ‘Technology-Enhanced Learning,’ where students (N=49) worked together for three months. Results indicate that interactional processes in collaborative situations were more often related to off-task than on-task topics. Off-task discussions were mostly concentrating on metacognitive issues, especially planning group work. Most of the on-task discussions were comments or answers to previous messages. Scripts had an effect on small-group activity, participation, and course grades, and a minor effect on the quality of collaborative interactional processes. This study provides teachers, educators and educational coordinators guidelines on how to organize and enhance successful collaborative learning in virtual learning spaces.

Digital tools as material resources for reasoning in environmental education

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Currently, the use of interactive digital technologies has gained its progress within teaching and learning activities. Through digital technology, information and knowledge are made accessible in new manners and our knowing and reasoning are to an increasing extent integrated with such external tools. The present study presents an empirical investigation regarding how students in a Swedish upper-secondary school are discussing and reflecting on their environmental impact in the context of using a carbon footprint calculator (CFC). The aim of our research is to scrutinize how such a tool co-operates with the students’ understanding and conceptual learning in relation to their environmental impact. By applying a sociocultural perspective, data have been collected through video documentation and the focus of the analysis involves what kind of meanings and activities such tool support. In the study 15 students worked with the CFC. First they calculated their personal carbon footprint, then they engaged in discussions regarding their own result in relation the others and furthermore in relation to the national average and to that of other countries. The results indicate that the conceptual constructions that are integrated into the digital tool, provide ‘short-cuts’ for the students’ reasoning, i.e. the CFC incorporates a range of conceptual distinctions and operations that the students may gain without fully mastering them in their original scientific form. In this sense thinking and conceptual understanding are scaffolded by the CFC that makes complex relationships accessible to the user. The tool, thus, enables ‘access points’ that make such discussions possible.

Teachers’ Competencies and Teacher Judgments

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Teachers’ diagnostic competence and their ability to judge students’ academic achievement is an internationally discussed topic. There is a consensus that diagnostic competence is essential for learning processes and also for long-term educational decisions. This symposium expands the research perspective by conceptualizing teachers’ diagnostic competence and its impact on accuracy of judgments about students’ achievement. The symposium also addresses the power of teacher judgments as a tool for reading assessment, and the effects of teacher trainings on their judgments during school transition from elementary to secondary school. The symposium will start with focusing on theoretical and empirical evidence on the conceptualization of teachers’ diagnostic competence taking teachers’ attitudes, motivation and self-regulation as components into account and examining the impact on the accuracy of teachers’ judgments. The second presentation analyzes teachers’ judgments about students’ achievement at the beginning of grade 1 and tests the hypothesis of a halo effect in teachers’ judgments questioning the capacity of teachers to distinguish fine abilities among students. A further perspective examines the power of teacher judgments as a tool for assessing students’ reading comprehension. A systematic rating scale for teachers has been developed and evaluated with results showing moderate to high relations to standardized reading assessment instruments. Finally, the systematic improvement of teachers’ accuracy of judgments by strategic teacher trainings will be discussed focusing on the example of teacher recommendations for the transition from elementary to secondary school. Concluding, the four presentations contribute theoretically and practically to research on one of teachers’ core competencies.

Conceptualizing Elementary School Teachers’ Diagnostic Competence and their Accuracy of Judgments

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Teachers’ diagnostic competence and their ability to judge students’ academic achievement is an internationally discussed topic. There is a consensus that diagnostic competence is essential for learning processes and also for long-term educational decisions. This symposium expands the research perspective by conceptualizing teachers’ diagnostic competence and its impact on accuracy of judgments about students’ achievement. The symposium also addresses the power of teacher judgments as a tool for reading assessment, and the effects of teacher trainings on their judgments during school transition from elementary to secondary school. The symposium will start with focusing on theoretical and empirical evidence on the conceptualization of teachers’ diagnostic competence taking teachers’ attitudes, motivation and self-regulation as components into account and examining the impact on the accuracy of teachers’ judgments. The second presentation analyzes teachers’ judgments about students’ achievement at the beginning of grade 1 and tests the hypothesis of a halo effect in teachers’ judgments questioning the capacity of teachers to distinguish fine abilities among students. A further perspective examines the power of teacher judgments as a tool for assessing students’ reading comprehension. A systematic rating scale for teachers has been developed and evaluated with results showing moderate to high relations to standardized reading assessment instruments. Finally, the systematic improvement of teachers’ accuracy of judgments by strategic teacher trainings will be discussed focusing on the example of teacher recommendations for the transition from elementary to secondary school. Concluding, the four presentations contribute theoretically and practically to research on one of teachers’ core competencies.

Halo effect in teachers’ judgment about students’ achievement

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This paper aims at analyzing teachers’ judgment about students’ achievement and tests the hypothesis of a halo effect in teachers’ judgment. In an empirical study in first-grade classes, teachers (n = 20) had to predict students’ responses (n = 180) at each of the 48 items of an evaluation intended to measure 8 domains: semantics, writing (words), phonology, oral comprehension, lexicon (words and pseudo-words), syntax, word recognition and math (writing numbers). We investigated the structure of the teachers’ predictions of students’ success at each item and compared it to the structure of the actual responses given by the students. Factor analyses performed on teachers’ judgment and students’ responses reveal different structure patterns: the variance explained by the first factor in teachers’ judgment is twice the variance explained by the first factor in students’ responses. The factor analyses also reveal dimensions of students’ responses that are not captured by the teachers. So teachers tend to overestimate a general factor of ability and they do not perceive
some specific abilities. Furthermore, logistic multilevel models (with items at level 1 and students at level 2) predicting the probability of a correct response at the items reveal a much higher between-students variance when models are performed on teachers’ judgments than on students’ responses. This indicates that teachers tend to overestimate differences in achievement between students. Overall, our results are consistent with the hypothesis of a halo effect in teachers’ judgment and question the capacity of teachers to distinguish fine abilities among students.

Assessing Teacher Judgment and Using Teacher Judgment for Assessment of Reading Comprehension

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Accuracy of teacher judgment remains an important consideration in educational decision making. In a series of studies (Feinberg & Shapiro, 2003, 2009; Martin & Shapiro, 2011), we have asked teachers to judge the scores of student performance on a variety of curriculum-based measurement assessments. Comparisons of correlational analysis and a ‘how close’ analysis, show consistent differences in the accuracy of teacher judgment. Across studies, differences have been evident between teacher judgment of rank orders of students (correlations) compared to teacher judgment of actual student performance. Additional studies have examined the development of an instrument designed to assess student reading comprehension using teacher judgment. Outcomes have shown moderate to strong relationships to standardized reading tests, as well as excellent psychometric characteristics. Implications for educational decision making and future studies examining the accuracy of teacher judgment are discussed.

Improving orientation processes by applying formal decision rules

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In Luxembourg entry into secondary schools is based on an orientation process whereby a committee, in which the teacher has a key role, decides which track would be most suitable for the student. The orientation should be based on academic achievement but research has shown non-performance related variables affect orientation decisions, whereby students with an immigration background and/or lower socioeconomic status are underrepresented in the higher track. This might be due to biases in teachers’ judgements resulting from the way they integrate the information upon which decisions are based. One way to reduce judgement biases is to apply formal decisions rules on the weighted integration of student information. We developed a program to train teachers in the systematic application of rules on the integration of key student characteristics when making
orientation decisions. After teachers rated student attributes in terms of their relevance for the orientation decision, they made orientation decisions for a set of students and their observed decision rules were computed. Teachers were then trained in the systematic application of rules by giving them feedback on the deviation of their observed decision rule from the optimal rule according to their relevance ratings. Results showed that, after training, teachers’ decisions became more concordant with rule based decisions. Although the application of formal rules does not provide normatively validated decisions, it may reduce judgement biases. Furthermore, as feedback based on formal rules can change the teacher’s decision making process, it may prove a valuable tool to improve assessment competence of teachers.

**Conditions and factors influencing sustainable learning from errors**

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Exposing learners with their own or other learners’ errors is considered to be helpful for developing a complete knowledge structure including knowledge on the limits of concepts or on typical errors. Furthermore, developing competencies in managing errors in an adaptive way is considered crucial not only in schools but also for lifelong learning in many professional fields (Keith & Frese, 2008; Oser & Spychiger, 2005). Yet, the potential and risks of learning through errors has been controversially discussed in instructional research and practice. Teachers often worry that if attention is attracted to (other learners’) errors, these errors instead of the correct solutions may be memorized (Borasi, 1994). Thus, in many classrooms the focus is on avoiding instead of learning from errors (e.g., Oser & Spychiger, 2005). Empirical research on the conditions and factors facilitating or hindering knowledge acquisition from errors is necessary in order to gain a deeper understanding when and how learning from errors is beneficial. The purpose of this symposium is to present and discuss recent studies addressing this issue from various perspectives: Timmers investigates factors influencing post-feedback behaviour after errors. Tulis and Dresel examine how students’ motivational and emotional self-regulation after errors relates to learning activities. Yerushalmi, Cohen, Mason & Singh investigate the effects of self-diagnosing and self-repairing errors. Finally, Eichelmann, Narciss & Schnaubert compare the effects of conventional fraction exercises and tasks-with-typical errors. Implications for further research and practice will be discussed by Johannes Bauer.

**Factors influencing post-feedback behaviour after errors in a computer-based formative assessment**

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Computer-based formative assessment (CBFA) can support student learning by generating automated feedback on erroneous responses. However, simply adding feedback to a CBFA does not guarantee that students seek and process the feedback. Foremost, students need to be willing to invest time and effort in CBFA, including processing feedback. This willingness is influenced by various factors, such as type of feedback and motivational beliefs. The studies presented explored learners’ feedback behaviour in a CBFA that automatically generated a knowledge-of-response feedback (KR) page after a test taker answered all items. For each item, this KR page presented whether it was answered correctly or incorrectly. In addition the KR page linked to additional feedback pages with remedial information per item. Learning analytics were used to examine individual and group differences in learners’ post-KR-feedback behaviour and factors influencing this behaviour. The CBFA registered per student if an item was answered correctly or incorrectly, and whether the corresponding additional feedback page was consulted. Results showed that variance in learners’ post-KR-feedback behaviour is explained by student achievement, correctness of response, and item difficulty. In addition, learners’ post-KR-feedback behaviour showed to be positively related to success expectancy, task-value beliefs, as well as student-reported effort.

Motivational and emotional self-regulation and adaptive learning activities after errors

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Contemporary research provides evidence that the experience of errors and impasses contributes to individual learning. Therefore, it is important to identify preconditions for adaptive reactions to and learning from errors. Adaptive reactions following errors maintain learning motivation and activating emotions in order to persist and focus attention on the task to identify the error. Therefore, learners have to use appropriate motivational and emotional regulation strategies. A theoretical model of self-regulation processes after errors is proposed. Two studies were conducted to examine (parts of) the proposed model. Study 1 (N = 55 students; Mage = 20.7) aimed at identifying error specific emotions and regulation strategies with stimulated recall interviews after a learning session. The main purpose of Study 2 (N = 53; Mage = 21.2) was to investigate the predictive value of different motivational and emotional regulation strategies (rated immediately after error feedback) on students’ dealing with errors and persistence. Regression analyses pointed to differential associations between regulation strategies and error specific learning activities as well as persistence. Results emphasize the importance of learners’ ability to regulate their level of motivation for subsequent (meta-) cognitive activities and adaptive learning behavior specifically adapted to the error.

Learning from mistakes: The effect of students’ written diagnoses on subsequent problem solving

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Self-diagnosis activities aim at fostering physics students’ learning in an examination context by providing them with time and credit for presenting written diagnoses of their solutions to quiz problems (i.e., identify where they went wrong, and explain the nature of their mistakes). To examine the effect of self-diagnosis activities on students’ capacity to self-repair their understanding, we investigated how well students self-diagnose mistakes on their own solutions to a quiz problem, and examined the effect of students’ self-diagnosis performance on subsequent problem-solving. Study groups in an introductory physics class of about 200 college students were divided into a control group and three intervention groups in which different levels of guidance were provided for self-diagnosis activities. To examine the effect of prior knowledge on students’ learning from self-diagnosis, we carried out the experiment twice, first in an atypical problem situation and then in a typical one. The findings show that the self-diagnosis score was only correlated with subsequent problem-solving performance in the context of a typical problem situation, and only when textbooks and notebooks were the sole means of guidance available to the students to help them with self-diagnosis.

Learning from Errors through Tasks-With-Typical-Errors

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Errors are often seen as being dysfunctional for the learning process. Traditional schooling seeks to avoid or to immediately correct errors to minimize the risk of learning incorrect solutions. But more and more, the potential benefits of learning from errors receive attention in instructional research. Errors are perceived as a learning opportunity leading the learner to a deeper understanding of the topic (e.g., Mathan & Koedinger, 2005). Facing students with domain-specific errors through tasks-with-typical-errors could therefore be beneficial for developing mathematical competencies including error detection and correction. Prior work has so far not systematically compared the risks and benefits of conventional mathematics tasks to tasks-with-typical-errors. Thus, this pretest-treatment-posttest-study aims at comparing the impact of tasks-with-typical-errors and conventional tasks on achievement, motivation, and metacognition. Students worked on tasks-with-typical-errors or conventional tasks in the domain of fraction arithmetic. Preliminary data analyses revealed no significant differences regarding posttest-achievement. However, students who had worked with tasks-with-typical-errors tended to make fewer typical errors in posttest.

Integrating Motivational-Affective Variables into a Cognitive Perspective on Learning with Media

Steffi Zander
This symposium focuses on empirical evidence for the importance of motivational and affective learner variables in learning with media and with different instructional strategies. Motivational and affective variables are expected to play a crucial role for directing cognitive processes and knowledge acquisition in educational psychology research (e.g., Dweck, Mangels, & Good, 2004; Linnenbrink & Pintrich, 2004; Pekrun, 2002). However, research in the field of learning with multimedia and the related instructional strategies, that considers both as an integral part of successful learning, must be extended and needs further elaboration. The effects of different instructional strategies on motivational-affective states of learner and the role of motivational-affective variables for cognitive processes and knowledge acquisition, are important matters to consider. The four presentations in this symposium explore and integrate these issues by providing empirical evidence for the theoretical link between instructional strategies in learning with different media and motivational-affective and cognitive processes. Moreover, the presented empirical findings help to interpret contradictory learning results and to inform instructional practices that promote successful development of learning potential in different media.

The Impact of Ability Self-Concept, Cognitive Load and Prior Knowledge on Knowledge Construction

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Based on central themes of the Austrian biology curriculum, we developed eight online-modules addressing several concepts around the ecology of alluvial forests. These modules were either designed after principles of direct instruction or as problem-oriented learning environment. Based on three out of this modules in a quasi-experimental pre-post-design predictors of learning performance were analyzed comparing direct instruction with problem-oriented learning within a sample of 463 Austrian High school student. Overall, results suggest that learners benefit more from direct instruction than from primarily self-directed problem-oriented learning. A more detailed analysis of predictors for learning performance within a linear regression analysis revealed that this effect is

...
mediated by some other variables. It seems that the basic attitude of learners against the learning environment influences either deep or narrow information processing. Learners with a high subject-related ability self-concept report about lower mental effort in information processing. This is related to lower performance compared to learners with low-ability self-concept who invest a higher amount of mental effort. More specific analyses reveal an Aptitude-Treatment-Interaction-Effect showing that this relation is rather distinctive in the problem-oriented condition than in the direct instruction condition.

The Integration of Worked Examples, Problem Solving and Mastery Goal Oriented Statement

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This study examined the effects of mastery goal oriented statements and individual goal orientations on students studying worked examples or problem solving. Sixty eight year nine girls from a Sydney High School were randomly allocated into one of four groups using a 2 (worked examples vs. problem solving) x 2 (mastery vs. no statement) x 3 (low vs. mid vs. high goal orientation) design. Post test results on both similar and transfer questions were examined. The results identified the mastery statement to be significantly demotivating, while the worked examples strategy and goal orientation the students held had significant impact on test and transfer. The results will be discussed in more detail in the presentation.

Effects of a Learning Instruction on Intrinsic Motivation in Game-based Learning

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In this paper, we examine the effects of a learning instruction on learning with an educational game. It was assumed that a learning instruction increases learners’ investment of mental effort and thus the learning outcome. However, concerning game-based learning we assume a negative effect on the learning outcome because of an impairment of intrinsic motivation. The results of our experiment indicate that the effect of the learning instruction is mediated through intrinsic motivation and moderated through player behavior. Whereas a minority of students, whose player behavior is characterized through a high amount of communication, could benefit a majority of students performed better without a learning instruction. A practical implication of this result is that instruction should be tailored on player behavior.

Investigating Affective Design Factors in Multimedia Learning

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Research on multimedia learning addresses the question how (computer-based) learning materials should be arranged to enhance learning. Cognitive factors are primarily taken into account; whereas affective factors are often underestimated, although they have been shown to affect cognitive processing and problem solving (e.g. Isen et al., 1984). We therefore first explore how learning materials should be designed to trigger affective reactions of learners, and second how these affective reactions influence the learning process. In web design studies, it has been shown that aesthetic aspects may facilitate positive affect. Usability, as another concept from web- and interface design, is an important condition for an effective performance with a computer-based system. However, usability aspects have not yet been taken into account to influence affective reactions of learners. We assume that a bad usability causes negative affect. For multimedia learning environments it could be shown that an appealing design causes positive affect (compared to a neutral design) and enhances motivation and transfer (Um, Song & Plass, 2007). In two 2x2-studies (N1=179; N2=182) we manipulated a multimedia learning environment in the conditions ‘classical aesthetics’ and ‘usability’ as well as ‘expressive aesthetics’ and ‘usability’ (high vs. low) and measured the learner’s affective reactions (positive and negative affect) during the learning process as well as the learning outcome (recall, comprehension, transfer). Data analyses consist of various F-Tests and structural equation modeling. Findings will be discussed with regard to implications for research on multimedia learning.

Supporting text learning: From the benefit of retrieval practice to the promise of active processing

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Learners have often great difficulty in learning from expository texts. They need support, not only in online comprehension of the texts, but also in creating a mental representation of the text content for later use, for example during a test. A promising strategy for the long-term retention of text is retrieval practice. Research has shown that retrieving information from a text through question answering can lead to better long-term performance than restudying the same text, and in some cases even to better transfer performance. In the first study of this symposium by Dirkx and colleagues, this benefit of text retrieval on transfer is demonstrated with high school students reading a text on probability calculations. However, the second study by Tabbers and colleagues shows that processing of feedback may be a crucial element in explaining the success of retrieval practice, as they fail to find a benefit on transfer when students are asked to recall a text without feedback. Moreover, the third study by Wagner and colleagues demonstrates that active text processing can be as effective as retrieval practice in creating long-lasting learning benefits. The final
paper by Llorens and colleagues suggests how active text processing could be supported by giving process feedback on text questions. In sum, the symposium provides a nuanced answer on the question how to support text learning, by not only establishing boundary conditions on the benefits of retrieval practice, but also by contrasting it to the promise of active processing.

**The testing-effect for retention of facts and application of knowledge**

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This study goes beyond the effects of testing on retention of facts, and investigates if testing also affects deeper learning (i.e., application) in the domain of statistics. Thirty-eight high-school students either repeatedly studied a text on probability calculations, or they studied the text, took a test on the content, restudied the text, and finally took the test a second time. The results show that testing leads not only to better retention of facts but also to better application of acquired knowledge (i.e., principles and procedures). In other words, testing not only benefits fact retention but also positively affects deeper learning.

**A text to remember: The limited benefits of retrieval practice for transfer performance**

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Fred Paas  
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This study investigated the effect of retrieval practice without feedback on long-term transfer from expository texts. After reading four expository texts, 72 participants were allocated to an explanatory recall condition, a verbatim recall condition or a restudy condition. A transfer test on two of the texts was administered immediately afterwards and a transfer test on the other two texts was administered one week later. It was expected that participants in the explanatory recall condition would outperform participants in the other conditions, especially on a delayed transfer test. Although explanatory recall indeed targeted a different level of text representation, no differences were found on transfer performance between the three conditions. So the benefits of retrieval practice when reading for transfer seem to be limited to a situation in which feedback is provided.

**Is testing truly better than elaborative studying?**

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Learners who are repeatedly tested in the learning phase show better long-term learning than learners who study only, whereas repeated studying is more effective immediately after learning. However, most studies that investigate this testing effect only compare a passive condition (such as repeated reading of an expository text) with an active condition (such as written retrieval of the text message). The advantage of testing might therefore be due to active learning rather than retrieval practice. We report an experiment in which an active, elaborative restudy condition was contrasted with a passive restudy condition and a testing condition. In both the testing condition and the elaborative restudy condition, participants were asked to write down the contents of an expository text they had read once. The only difference was the presence versus absence of the text during writing. In addition, half of participants were tested five minutes after learning and the other half one week later. In the immediate test, elaborative restudying resulted in better learning than retrieval. One week later, participants in the two active conditions outperformed those in the passive restudying condition but did not differ from one another. A testing effect was thus observed in comparison to the passive but not active restudying condition. Our findings suggest that deeper processing without retrieval can produce equal long-term benefits as retrieval from memory.

**Analyzing the effects of feedback in the context of task-oriented reading performance**

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Improving students’ ability to search the text in task-oriented reading may require formative feedback that guides the learner towards successful task completion. This research precisely aims to disentangle this issue. Ninety-three high school students read texts and answered multiple-choice questions displayed in a new software application that records reading times and sequences. After answering each question, students received a feedback message depending on their experimental condition (i.e., process feedback, corrective feedback or control). Process feedback increased performance and search skills, in comparison to simpler kinds of feedback. This result contributes to the development of automatic tutors that train reading comprehension skills.

Exploring Facets of Self-Regulated Learning: Measurement, Modes of Action and Promotion

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Self-regulation is considered an important prerequisite for effective learning and academic achievement. Therefore, it is essential to understand the dynamics of different aspects of self-regulated learning (SRL) and to develop, test and apply appropriate measurement instruments as well as effective interventions. The aim of this session is to address different aspects of research on SRL including goal-orientation, motivation and procrastination and alternative ways of measuring and fostering SRL. Ogrin and Schmitz address students from secondary schools. They focus on the effect of motivation for mathematics on SRL in that domain, leaving ambiguity about causal direction. Krause looks at a university student population and analyzes how goal focus (process vs. outcome focus) influences their level of procrastination; results indicate a decrease of procrastination through process focus. Klug et al. address students from secondary schools to develop and test a new kind of questionnaire for measuring goal-orientation. They include the target population in the process of item formulation, revealing good reliability and validity. Bellhδuser and Schmitz present a web-based training for fostering prospective university students’ SRL, showing improvement for the intervention group concerning SRL and mathematical achievement. The studies presented in this session indicate that aspects of SRL have to be investigated differentially and addressed specifically when planning on measuring and fostering SRL and hence academic achievement.

Effects of Motivation on Self-Regulated Homework Behavior

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This study aims at analyzing the influence of homework motivation on self-regulated homework behavior. Aspects of self-regulated learning (SRL) have been linked to better academic achievement.
(e.g. Richardson, Abraham & Bond, 2012). Therefore, SRL has been suggested as a thorough theoretical framework (Trautwein, Lüdtke, Schnyder & Niggli, 2006) and also a prerequisite for committed homework behavior (Eccles & Wigfield, 2002; Winne, 2005; Trautwein et al., 2006). By means of cross-lagged structural equation modeling we studied the causality between homework motivation (HM) and self-regulated homework behavior (SRHB). Data derives from 527 students from 28 secondary modern schools in Germany with 51% male students at the mean age of 11.1 years (fifth grade). Measurement took place twice with a time lag of seven weeks of regular schooling. Preliminary analyses hint to ambiguity about the causality between HM and SRHB. There is indication that engaging in SRHB causes an increase in HM and also has an effect on sustaining SRHB. In line with previous research (e.g. Trautwein & Koller, 2006) SRHB might induce a deeper processing of tasks during homework completion.

**Understanding procrastination – A dynamic model of procrastination and goal focus**

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Procrastination, a common phenomenon in academic contexts, is defined as the subjectively aversive inability to initiate or complete the pursuit of a given goal. We present a dynamic model that centers on the role of goal focus during goal pursuit for procrastination. The model hypothesizes that focusing on the means of goal pursuit (process focus) reduces procrastination, particularly when fear of failure is high. In contrast, when means are perceived as unpleasant (high task aversiveness), focusing more on the outcome of goal pursuit should reduce procrastination while highlighting the importance of goal achievement. In a 6-week longitudinal study comprising 9 measurements points, fifty university students answered online-questionnaires while they were studying for an exam in developmental psychology. We found that (a) procrastination decreased over time when students were more process focused, (b) procrastination decreased with an approaching deadline, and (c) multilevel regression analyses revealed no indication for a moderating effect of fear of failure or task aversiveness in the relationship of process focus and procrastination. The second study aimed at clarifying the relationship between procrastination and goal focus, and worked with descriptions of typical academic scenarios. Psychology students rated process vs. outcome focus items and their expected procrastination with regard to the scenarios. Structural equation modeling showed that process focus was (a) negatively associated with procrastination and with fear of failure, and (b) might be a mediator in the relationship between procrastination and fear of failure. The current studies provide first evidence that process focus is negatively related to procrastination.

**How to Measure Students’ Goal Orientations? A Participative Approach**

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Goal orientations as a motivational construct are an important part of self-regulated learning (SRL) and a prevailing topic in the present literature. It is recommended that the respective instruments be improved. In large-scale research on SRL, questionnaires are essential, but their ecological validity could be increased by creating a better fit of the chosen language to the target group. Thus, we let students participate in the process of formulating questionnaire items. We describe and test-theoretically analyse newly developed scales and test their criterion validity. N=5235 students from 48 Austrian schools took part in the study. Internal consistencies were very good for each scale in two subjects (Cronbach’s a from .82 to .90). The scales together explain 73% of the total item variance for the subject ‘Math’ and 70% for the subject ‘German’. Confirmatory factor analyses revealed good fitting models (for both Math and German: RMSEA=.05, SRMR=.03, CFI=.97). Item factor loadings ranged from .71 to .89 with one outlier of .51. The scales showed inter-correlations and grades could be predicted in latent regression analyses as expected. The model fitted equally well for boys and girls, whereas the predictive power was higher for girls in both subjects. The scales show similar inner consistencies to existing questionnaires while being more economical, ecologically valid and better adapted to the target group.

Fostering Self-Regulation Online - Effects of a Web-Based Training on Mathematics Performance

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Trainings on self-regulated learning (SRL) have been shown in several meta-analyses to be effective both in improving self-regulation skills and in objective measures of performance. However, human trainers can only reach few people at the same time. Web-based trainings (WBT) could improve efficiency as they can be distributed to unlimited numbers of participants. We developed a WBT on SRL and tested it with 175 participants in a randomized control evaluation study. Results showed that students in the experimental group showed significantly greater improvements in both subjective measures like SRL questionnaires and objective measures like a test of mathematical performance than did the control group. Additional coaching did show an effect on SRL but not on performance.

Dialogical approaches for analyzing group collaboration

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The increasing emergence of collaboration as a crucial aspect both in the educational and in the professional domains compel learning theories to account for the processes that allow people with different worldviews to work and learn together. A growing number of investigations regarding collaborative processes reveal the learning potential that resides in the responsive process of agreements and oppositions of multiple perspectives. In particular, studies building forward on Bakhtin’s work on dialogicality emphasize the crucial role that otherness and diversity play in the generation of meaning (Wegerif, 2008). In a variety of dialogical approaches, scholars have developed concepts and methods for analyzing the interactive, contextual features of learning at the individual, group and institutional levels. By using the concepts of voice, polyphony, inter-object, and I-position the presenters of this symposium have investigated some aspects of collaboration related to the dialogical tensions that enhance learning. On the one hand, there is an interest on the role of diversity and multiplicity of perspectives in collaborative settings; on the other hand, there is an attempt to account for the development of meanings and of group members’ identities across collaborative projects. The aim of the present symposium is to put these two kinds of interdependencies on the forefront, discussing how dialogical investigations of the learning processes stemming from collaboration can enrich and improve theory and practice of learning and instruction. References Wegerif, R. (2008). Dialogic or dialectic? The significance of ontological assumptions in research on educational dialogue, British Educational Research Journal, 34, 347-361.

Unity and Diversity in a Collaborative Research Project

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Studies on crossing boundaries show evidence that diversity in perspectives amongst group members does not need to be overcome by unity in order for collaborative learning to take place. This study explores what mechanisms allow groups to maintain both unity and diversity. A longitudinal ethnographic study of a Dutch inter-university research project is reported. Data gathering included interviews, extensive observations of meetings, and collection of project documentation, reports, email and online communication. Discourse analysis of communicative exchanges throughout two years considered how the group members negotiated diverse project directions and diverse theoretical perspectives. The results show two mechanisms. The first mechanism refers to an extension of diverse individually into diverse collectively voiced positions. The second mechanism includes a continuous shift in the way these diverse collective positions are constructed. This latter indicates how various types of boundaries are continuously negotiated during collaboration. I conclude that research on crossing boundaries should consider unity and diversity as two dialogically related and multilayered dimensions, both essential in achieving the initial intentions for collaborative learning.

A challenge to the conceptualization of ‘shared objects” in innovation-oriented partnership

Ritva Engestrom
Recent studies on the negotiations in cross-disciplinary and multi-professional collaboration have shown that diversity, by means of bringing people with diverse background together, is not a sufficient condition for efficient negotiation processes to come to the fore (Akkerman et al. 2006). Multi-professional collaboration in innovation-oriented partnership seems to require forms of activity in which participants define themselves in order to re-organize their thinking and foster joint long-term processes of transformative learning. The aim of this paper is to search for a methodological view that deals with the emergent process of knowing and overcomes the dichotomy between individual and collective in collaborative settings of transformative learning. From a dialogical point of view, we challenge the idea of a ‘shared object’ of activity by investigating the subjective mechanisms that allow individual participation in collective processes. The paper includes analyses of group collaboration, which have taken place in two cross-disciplinary, integrated research projects. Our findings show the role of situational creativity in linking personally experienced connections between people and objects in the time and space, both of current and previous or anticipated events. Beside shared object we suggest that subjectively established ‘inter-object’ needs to be conceptualized for studying the boundaries to be crossed.

The process of sensemaking in group collaboration across multiple conversations

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Investigations on group collaboration often typify it in terms of emergent consensus and focus on situated interactions, while there is a need to account also for broader socio-cultural processes. We maintain that Bakhtin’s concepts of voice and polyphony allow investigating both the role of diversity and the broader socio-cultural contexts of collaboration. In the dialogical framework adopted, voices are considered ‘speaking personalities’, voicing a perspective on a topic. The aim of this paper is to analyze the role of multiple voices in face-to-face meetings of a multidisciplinary team of professionals finalizing a web-platform. In particular, our research questions are: 1) which voices are implicated in the creation and maintenance of topics of discussion (within and between situations of sensemaking) and in the negotiation of collective actions?; 2) what role do each of these voices play the collaborative process? For such aim, we detected the voices that at an exploration of the data resulted most central: the personal voices of participants, Participants’ professional groups, the expected final users, the voice of the colleagues (even when not attending the meeting), and the team as a collective voice. We then interpreted the role that such voices played through a qualitative discourse analysis. Our findings show that a specific set of ‘virtual participants’ (other’s voices, expert group voice, and final users’ voice) entered in dialogic relationship with participants’ voices and allowed participants to a) construct and maintain topics of discussion; b) use resources coming from other space-times, enriching sensemaking; c) negotiate collective action.

A blended learning course as a context to support the democratic expression of the Self
In this paper, the theoretical approaches of bakhtinian Dialogism and Dialogical Self Theory by Hermans are integrated. Namely, we refer to the conceptualization of first, second, and third voice made by Bakhtin. The first one is the voice of the author, which is addressed to a second person and involves a third ideological and authoritarian voice. The different power relations among these voices shape for Bakhtin three types of dialogue: Magistral, Socratic, and Menippean. Hermans conceptualizes the Self as a set of dynamic I-positions in dialogical and power relations with one another. In this paper, we use the definition of the three forms of dialogue as a mean to grasp the relations among I-positions in blended learning contexts. More specifically, we answer the research question ‘How do the three forms of dialogue feature the Self over a blended course?’ We analyzed the transcripts of eight focus group discussions conducted at the beginning and at the end of two blended courses involving 52 burgeoning psychologists. We used the Dialogical Discourse analysis developed by Wortham to look at the three kinds of dialogue. Results show that students develop a new structure of the Self, enriched by renovated relationships among the first, the second, and the third voice. A movement from the Magistral to the Menippean dialogue occurs at both narrated and interactional levels. Unlike the learning environments students usually attend, the blended one sustains the formation of a Menippean dialogue among voices and within the structure of the Self.

**Designing literacy interventions to fit local contexts in Australia, Chile, New Zealand and Ecuador**

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Countries face different challenges in literacy goals. Australia and New Zealand need to improve equity given relatively high quality. Chile and Ecuador face both quality and equity challenges. Variations in local features such as in teacher pedagogical knowledge and skills contribute to a country’s capability for improvement (Mourshed, Chijioke & Barber, 2010). What aspects of instructional design need to be contextually fitted? The papers in this symposium describe the interventions designed to raise student achievement given literacy goals in each country and local contextual variables. They focus on measures of teaching within those interventions and what they reveal about effective design in these contexts, including for treatment integrity and within design-based research approaches (eg Anderson & Shattuck, 2012). The tools and their purposes vary reflecting the presence of variations in teaching quality. The papers contribute to our understanding.

Scope and limits of improving teaching practices for developing early literacy in Chile

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Improving early childhood development has a key role in equalizing long term opportunities. This paper reports on two studies of implementation of Un Buen Comienzo (UBC) (A Good Start), an in situ two year professional development program. This program is designed to improve teacher practices and early literacy levels among disadvantaged preschoolers attending public schools in Chile. The studies involved a randomized controlled trial design with 64 schools in the urban Santiago area, and a continuous improvement project with 27 schools of the VI Region. Results show that while the interventions show high impacts on improving teacher practices, they have had modest effects on child development. It appears that initial levels of teacher quality were at such a low level in instructional support, that the impact of the program on teacher practices was neither enough in magnitude nor of sufficient exposition to children. Two lessons have emerged from these projects. The first is that it is necessary to intensify interventions to ensure that teachers develop the necessary competences to sustain the improvement in teacher practices after the intervention is finished. The second relates to the need to improve the quality of pre and inservice training for teachers because the current levels limit the possibilities of introducing significant changes for instructional support in classrooms.

Raising literacy levels using blended learning: A design based approach in New Zealand

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New Zealand has a high quality but low equity profile for literacy achievement in a context of local school autonomy and a history of teachers as problem solvers. This paper reports on a design based intervention in urban primary and secondary schools serving culturally diverse students from low SES communities. The intervention capitalises on a partially implemented programme in the schools which uses digital devices and applications to raise reading comprehension. Learning and teaching measures have been used to identify effective components which can be more systematically implemented. Classroom observations provide a profile of the use and quality of the literacy instruction and to identify effective instruction and contribute to the redesign of instruction for cluster wide implementation. The paper demonstrates how observations of classroom instruction are used to identify promising new practices and contribute to the design of more effective instruction in the context of a system that is already generally of high quality in literacy teaching but with low equity. The study adds to a growing number of interventions which use a design based approach in partnerships to solve problems associated with school effectiveness; in this case showing how the analysis of the variability of practices, can be used to identify, describe and ultimately test new instructional forms.

Designing better schools in Australia: building teacher capacity in a problem solving process

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In Australia, educational ‘results are inequitable in the sense that differences among students in their literacy levels reflect to a marked extent differences in their social background’ (McGraw, 2007:14). In recent years, one of the objectives of the Australian education reform agenda has been to reduce educational inequity. Several government policies have focussed on improving teaching quality and classroom instruction through external auditing processes, enhancing school leadership capacity, proposing more school autonomy, and using high stakes national testing as a school accountability measure. Recently a number collaborative partnerships, including university-school-community partnerships, have been developed. These partnerships are challenging the centralized notions of large-scale reform efforts in favour of design partnerships for localized, innovative solutions to the systemic and enduring problems of educational disadvantage. We present an account of one such project and argue that projects such as these, built and supported locally, are necessary if we are to understand the complexity of educational disadvantage and school performance. It is research such as this that will help us design better schooling.

Closing the Gap: Improving Poor Children’s Success at School in Ecuador

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Previous research has shown that poor children in Ecuador have much lower levels of cognitive development than even their slightly-better-off peers. They start school already at a disadvantage and, on average, they never make up the lost ground. In a randomly selected sample of nearly 21,000 first-grade students and their teachers from nearly 300 schools, we examine school, teacher, child, and home characteristics to try and answer the question, ‘What kinds of schools and teachers seem to be most successful at addressing poor children’s needs, and in particular, at closing the gap in cognitive development between poor children and their better-off peers?’ Preliminary observations from data analyzed with the CLASS quality rating instrument suggest that poor children in general attend very poor quality schools where they are rarely given opportunities to think critically, ask questions, or participate meaningfully or actively in their learning.

**Interactive e-assessment**

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This demonstration will explore interactive digital tools that can be readily incorporated into assessments that are designed within common learning management systems. The interactive tools include Excel spread sheets with embedded macros, java applets and QuickTime virtual reality images. The examples are contained on our website http://www.transformingassessment.com and participants are able to log on to the website before the demonstration and explore the examples.

**Adaptive Guidance in Problem-based Learning with ICT**

Claude Muller Werder  
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This ICT demonstration examines the importance of adaptive guidance in Problem-based Learning (PBL) and demonstrates how ICT can effectively and efficiently support teachers in their function to guide and support the learning process. In a first theoretical part, PBL is analysed from an instructional psychology point of view. This analysis identifies underdirecting of the learning process as a considerable risk of PBL among others like cognitive overload or demotivation of students due to an inadequate assessment system. In the debate about constructivist instruction (e.g. Tobias & Duffy, 2009), all proponents have highlighted the central function of an appropriate guidance and customized support of the learning process. This position was also confirmed by a recent meta-evaluation of constructivist instruction (Alfieri, Brooks, Aldrich & Tenenbaum, 2011). Concentrating on the aspect of guidance in PBL with ICT, designs for adaptive guidance in several PBL formats (classic PBL, blended-learning, and e-learning formats) using Moodle, one of the world’s most commonly used learning platforms, are demonstrated.

**CamCon - An online-based learning platform with integrated research functionalities**

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The Cambridge Contest (CamCon) is an online-based learning platform to accompany mathematics-based courses (statistics, economics, physics etc.). The platform is unique in that it integrates learning and research innovations. The learning innovation is that it allows for the personalisation of the learning process even in courses with large numbers of students. In particular, teachers can automate the generation of sufficiently demanding individual-specific problem sets using either randomly pertubated datasets (when calculation is involved) or randomly pertubated parameters (when the issues are conceptual). As such, the software requires students or student groups to work out unique solutions pertaining to their individual problem set. This feature prevents direct plagiarism and instead encourages cooperative and conceptual learning. It also secures the control necessary to conduct research in classroom contexts. The core research innovation of CamCon is that it allows the researcher to randomize different forms of performance feedback. Researchers can further enforce participation by restricting online access to fully worked out sample solutions to those students who complete an integrated learning-log and achieve a threshold score. These features make the CamCon ideally suited for experimental research into learning processes. In the workshop we demonstrate CamCon’s current features, discuss future developments and report on an ongoing experimental research project.

Quality of Assessments and Assessment programs: demonstration of an online evaluation system

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In this session a new online evaluation system to evaluate the quality of tests, assessments and assessment programs is demonstrated. In this new online application we will use an argument-based approach to quality that is also used in the validation of tests and assessments. Within this method a quality-argument is built and systematically backed up with evidence. When the argument and evidence are reviewed by test users or auditors, they can decide whether the test or assessment is good enough for the specified purpose of the test. In the ICT Demonstration we will show the application and elaborate on the theoretical framework that is incorporated. Furthermore, we will also demonstrate how quality-arguments are built and evaluated. During the demonstration of the application the audience is invited to participate in evaluating the evidence that is collected to support the quality of tests and in discussions on the usefulness of the application.

Computer-supported note-sharing to enhance joint sense-making

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We will demonstrate a note-sharing tool designed to bridge classroom activities such as teacher lectures, computer-based individual work, group work and class discussion. The tool was designed with two aims in mind: to sustain and display arguments as a basis for joint sense-making, and bridging various learning activities. The technology, made available on PCs and iPads is remarkably simple. It uses features known from Twitter, such as short statements and options for hash tagging to

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form aggregation of related statements. We will demonstrate the tool and report on a study where the tool was used in the setting of a modern history class in a Norwegian senior high school. The study focuses on the impact of the note-sharing tool and on students’ participation across classroom activities.

**School adjustment and career awareness during transition from elementary to junior high school**

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The relationship between adjustment behavior and career development during the transition period from elementary to junior high school was investigated. Female Japanese students (n = 74) completed the School Adjustment Scale and the Career Awareness Scale. The former measures five types of school adjustment behavior: disciplined, prosocial, assertive, isolated, and learning behaviors. The latter measures four areas of career awareness: interpersonal relationships, information utilization, future planning, and decision-making. Approximately one year after the first measurement, they completed the same scales again. Hierarchical regression analyses were conducted to examine the relationship between school adjustment behavior and career awareness. The results showed that school adjustment behavior tended to contribute to career development in the small-sized school than in the large-sized school.

**Personality traits, motivation and volitional strategies as predictors of students’ math achievement**

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The aim of the study was to examine the relationships between previous knowledge, different personality and subject specific motivational dimensions, and students’ math achievement in secondary school, as well as the effects of these variables on their achievement. A total of 386 first-year students (142 boys and 244 girls) of secondary schools in Slovenia participated in the study. Their average age was 15.7 years. Different measures were used to assess students’ previous knowledge, personality traits, their values, subject-specific interest, self-efficacy, and volitional strategies. Students’ final math achievement was also collected. A preliminary analysis showed differences between boys and girls in most of the measured variables, therefore further analyses were performed for girls and boys separately. Path analysis was used to test the model of a direct effect of previous knowledge on the achievement, and indirect effects of previous knowledge, personality traits and values on the achievement through subject specific motivational variables in math. Adequate fit of our data to the proposed model was found. The results of our research are consistent with previous research findings, but some gender-based differences were also found. Theoretical and practical implications of the results are discussed.

**Cognitive processing of written peer-feedback: an eye-tracking study**
Feedback on student performance is central to formative assessment approaches. A large variety of feedback types produce differential effects on feedback-perception and performance. In peer feedback, students often perceive their peers’ competence to provide feedback as inadequate, resulting in low application. Peer feedback literature identifies mindful processing of the peer feedback as important for its efficiency. A systematic investigation of such mindful (cognitive) processing together with the impact of feedback content and sender competence level is still lacking. In this study, the impact of peer feedback content and sender competence level on mindful (cognitive) processing will be investigated. A 2 X 2 factorial design varying feedback content (concise general feedback [CFG] vs. elaborated specific feedback [ESF]) and competence of the sender (high vs. low) will be conducted with psychology students. They receive a scenario containing an essay by a fictional student, feedback by a fictional peer, a feedback perception questionnaire, an essay revision task, a distraction task and a recall task. Eye tracking technology enables the measurement of how the written peer feedback is read, e.g. what words, sentences, remarks have been read or re-read in predefined areas of interest. Together with information on what has been revised, what has been recalled and how the peer feedback was perceived, conclusions about ‘mindful’, i.e., cognitive, processing can be drawn. Two case studies indicate that ESF is more mindfully processed than CGF. Statistical analyses for the effect of competence level and feedback content on mindful processing will be presented at the conference.

Recognizing, Assessing, Motivating, and Evaluating Learning with Digital Badges

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Digital badges are a transformative new way of recognizing learning. They have exploded in popularity in the last year. This poster will present four sets of design principles for using digital badges to support learning. These principles emerged from the first year of the Badge Design Principles Documentation (DPD) project. This project documented practices for using digital badges in the thirty diverse projects that were funded by the MacArthur Foundation’s Badges for Lifelong Learning Initiative. The DPD project examined how the intended principles in each of the other projects were transformed as innovators attempted to enact and formalize those practices in the particular educational context. By looking across development projects, our project identified more general badge design principles. Four categories of practices and principles have been derived: recognizing learning, assessing learning, motivating learning, and evaluating learning. An extensive search for the relevant research literature for each principle has been conducted. These principles, along with examples from projects and the relevant research literature, will be quite helpful for
others who wish to use digital badges. Our poster will introduce attendees to an open social network wherein anyone who wishes to use this information and contribute to the discussion and research literature may do so.

**Professionalization in Early Education (PRIMEL) – First results of the questionnaire data**

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In the last years the requirements to kindergarten and preschool have changed from a caregiving to an educational institution. Therefore, German politics and society has drawn attention to the professionalization of these institutions. Especially, the demand of utilizing various skills within the everyday working life of teachers in a professional manner has increased in the last years (Fríhlich-Gildhoff, Nentwig-Gesemann & Pietsch, 2011; Rathgeb-Schnierer, 2008). Beneath the development of professional skills, there is a need to put more attention to teachers’ attitudes towards educational and psychological theories and the reflection on that (Nentwig-Gesemann, Fríhlich-Gildhoff, Harms & Richter, 2011). This presentation focuses on one aspect of the PRIMEL study which is to investigate whether teachers’ attitudes towards and commitment to pedagogical and psychological backgrounds differ through varying education degrees. The sample consists of N = 90 kindergarten and preschool teachers of different educational levels in Germany and Switzerland. Among other things, they have to fill in a set of questionnaires on their attitudes and self-concepts according to four specific domains (natural science, mathematics, physical education and art). First results of the questionnaire data show group differences in attitudes towards pedagogy but no differences regarding the domains except higher values in self-concept regarding the domain art for the German teachers. Further analyses should show, whether the self-descriptions of the teachers are replicable in the whole sample and could be manifested in the observable behavior of the teachers in their daily routine in kindergarten.

Corrective feedback: an interpretative and communication process

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The aim of the paper is to present a pilot research within my thesis research on error correction as a communication and interpretative process. In the context of contemporary education not only in the Czech Republic it is necessary to perceive the error correction and feedback in terms of the development of competencies, which are the main aim of education. And one of the important tools how to achieve this aim is assessment for learning, in other words formative assessment. The main research question is how teachers reflect the fundamental role of error correction and feedback and how they fulfil its formative aspect. Error correction is strongly associated with the summative evaluation, and this may cause that pupils are afraid of making mistakes, which teachers consciously try to suppress by a wide range of strategies. A controversial topic among teachers appears to be written error correction.
Preschoolers’ Metaphors Generation during Scientific Engagement as Indicator of Curiosity & Attitude

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Metaphors and analogies use is a fundamental mechanism of human cognition which reflects our perceptions. We think, understand and construct knowledge and sometimes function by how we perceive metaphors and analogies. These constructs are also well-known for their additive value to learning. In science education, the use of metaphors and analogies has been shown to enhance the quality and quantity of teaching and learning, to promote high-level conceptual understanding, to generate inquiry and to interpret and report research findings. The current study is designed to explore the role of metaphors as indicators of a desirable emotional state - being curious and having positive feelings and attitudes towards scientific engagement. Holding positive attitudes towards science, feeling motivated to learn science and perceiving it as interesting are all factors that predict scientific engagement and achievement in the long- and short-term. Achieving this desirable state is especially important in the early years, since a decline in attitudes towards science may start already in primary school. Verbal and behavioral responses of 41 preschoolers were documented during scientific engagement and an integrated quantitative-qualitative approach was utilized for data analyses. Results show that preschoolers generate spontaneous metaphors, and utilize them to express various emotional valences. Overall, the more curious preschoolers generated metaphors which entailed positive emotional valences and expressed a desire to engage in the activity. Additionally, girls showed more positive responses towards the observed scientific phenomenon than boys. Findings suggest that preschoolers’ spontaneous metaphors generation can serve as indicator of attitudes and curiosity toward science.

Triangulating ants, protector geese, and slime mold armies: Routes to misconceptions about emergence

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Interest in teaching about emergent systems and overcoming learner misconceptions has increased with our recognition of the ubiquity and importance of complex systems. Although a number of misconceptions have been identified across domains, our work has shown that the development of misconceptions is domain specific. In particular, learner misconceptions are closely tied to their perceptions of the perceived goals and capacities of agents operating within the system. We collected written protocols about three different emergent phenomena from 44 novice undergraduates. We identified the most common misconceptions, and traced those misconceptions to specific beliefs about the agents’ needs, their physical capabilities, and their ability to engage in higher-order thinking. With this new information, we can build more accurate models of learners’ conceptualizations of emergence, and identify more effective ways to dispel misconceptions and replace them with correct representations.

**Grade 7 students’ intentionality and reasoning with science news reports**

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Profiling adolescent students’ opinions about using science news reports can inform science news-infused instruction. This study reports on grade 7 students’ measure on the Views of Science News Instruction Questionnaire (VSNIQ). The validated 32-item VSNIQ was administered to 391 students from 4 teachers using different instructional approaches in a secondary school. Confirmatory factor analysis of student responses revealed 4 dimensions (interest, authority, judgment, and practicality) aligned with the original design structure. Cronbach a analyses revealed internal consistency values of the overall questionnaire and subscales (0.86, 0.92, 0.87, 0.93, & 0.81). The data indicated that Taiwanese Grade 7 students hold moderate views of reasoning with science news overall (Average = 2.90, SD = 0.51). Moreover, systematic science news instruction that addresses the intentionality of learners to apply science knowledge and actively interact with authors’ ideas can assist students to develop adequate views of science news.

**Learning and eye fixation patterns in virtual versus physical science laboratories**
This project analyzed high school students’ eye movement while learning in a simulation-based laboratory (SBL) and a microcomputer-based laboratory (MBL). Both the SBL and the MBL used computers to collect, graph, and analyze data. A major difference was that the MBL was a physical laboratory, whereas the SBL displayed everything on a monitor. Fifty senior high school students at three urban public high schools in Taipei were randomly assigned to the MBL and SBL settings. The participants conducted the Boyle’s Law experiment and completed pre- and post-tests and interviews. FaceLAB and ASL MobileEye were used to record each participant’s eye movement in the SBL and MBL settings, respectively. The results showed that lower achievers improved significantly from pre- to post-tests of concepts. The SBL group tended to repeat more experiments. Moreover, the MBL group’s performance on the worksheets was moderately correlated with their posttest. However, correlation was not found for the SBL group. Furthermore, at the beginning of the laboratories, the SBL group had a higher percentage of fixations with longer fixation duration, which implies more attention and deeper cognitive processing, in the experimental zone, while the MBL group focused on the worksheet zone. Then, the SBL and MBL groups moved their attention to the worksheet and the experimental zone, respectively. This study concludes that, for e-learning, students tend to start off on doing the experiment, and then thinking on the questions on the worksheets. For physical laboratories, students tend to think before doing.

Reappraising the relation between mental models and predictions: A study on heat convection

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While prediction is proposed as a central function of mental models, to what extent students can run their mental models to make a prediction for a physics phenomenon remains uncertain. This study first aimed to investigate thirty college students’ mental models of heat convection, and then to examine the relation between their mental models and prediction of conduction-related phenomena. A series of semi-structured interviews were conducted to probe the participants’ mental models and predictions of heat convection, and the constant comparative method was adopted for data analysis. The results reveal that the participants possessed a variety of mental models of heat convection, and nearly half of the participants held a scientifically compatible one. In addition, no significant relation was found between the participants’ mental models and predictions. The participants’ mental models could not successfully induce a specific prediction not only because of a flawed manipulation, but because of the adoption of other types of mental representation or resources to fulfill their prediction. The findings of this study have some implications for designing model-based instructions and for developing the theories of mental models.

Epistemic beliefs, conceptions of and approaches to learning biology among college students

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Silvia Wen-Yu Lee
This study investigated the relationships among college students’ epistemic beliefs in biology (EBB), conceptions of learning biology (COLB), and approaches to learning biology (ALB). The questionnaire responses from 303 college students gathered to analysis their self-reports of the three corresponding constructs. The results of confirmatory factor analysis revealed an acceptable model fit for the questionnaire constructs. The analysis of the structural equation model revealed that students’ epistemic beliefs in biology were the significant factors in explaining their conceptions of learning biology, which in turn contributed to their approaches to learning biology. More specially, students who viewed biological knowledge as uncertain tended not to have lower-level conceptions of learning biology (i.e. learning biology as memorizing, testing, calculating and practicing), while students with higher epistemic beliefs in biology about justification might trigger their higher-level conceptions of learning biology (i.e. learning biology as increasing one’s knowledge, application, and understanding with seeing in a new way). The students’ lower-level conceptions of learning biology were also found to be the significantly positive factor in explaining their surface strategies and negative factor in explaining their deep strategies. On the other hand, students’ higher-level conceptions of learning biology is the significantly negative factor in explaining their surface strategies and positive factor in explaining their deep strategies when learning biology. However, this study also found that students who viewed biological knowledge as uncertain tended to not hold deep strategies of learning biology.

Peers regulating each other? Evolutions in peer tutoring groups’ socially shared regulation

Although recent socio-cognitive models on learning and metacognition highlight the facilitative nature of collaborative learning when promoting metacognitive regulation, as well as the importance of social regulatory mechanisms within collaborative settings, little is known about the metacognitive regulation behaviour of and in collaborative groups. The present study investigates evolutions in reciprocal peer tutoring (RPT) groups’ metacognitive regulation by analysing peer interaction patterns. More specifically, evolutions over time in the individually-oriented, co-regulated, or socially-shared focus of RPT-groups’ regulation are studied. The present study therefore contributes to both the emerging research on social regulation and to process-oriented studies on tutoring. Seven face-to-face RPT-sessions of five randomly selected RPT-groups were videotaped (+/- 70 hours
of video data) and analysed with a literature-based coding instrument on metacognitive regulation in collaborative settings. Differences over time in the individually-oriented, co-regulated, or socially shared focus of RPT-groups’ regulation behaviour will be analysed by means of binary and multinominal logistic regression analysis. Results will be presented in detail at the conference.

**Explanation Generation, Not Explanation Expectancy, Improves Metacomprehension Accuracy**

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Comprehension monitoring (metacomprehension) is important to learn proficiently. Previous studies have shown that metacomprehension accuracy is generally poor, but improves when readers engaged in activities which promote valid cue use reflecting their situation model. However, the question still remains as to which cognitive process causes the improvement of metacomprehension accuracy. This study examined whether college students’ metacomprehension accuracy improves when they expect a future explanation during reading (active encoding) or when they actually generate an explanation (encoding plus active retrieving). In the experiments, participants read five texts. During reading, some students expected that they would generate explanations, but did not actually generate them. In contrast, some students actually generated an explanation of the text after reading. All participants then rated their comprehension and completed tests on the materials. Results revealed that metacomprehension accuracy was greater for the group that actually generated explanations than for the expectancy or control groups.

**Children’s scientific thinking and their metacognitive ability to identify good and bad reasoning**

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According to Klahr’s (2005; Klahr & Dunbar, 1988) Scientific Discovery as Dual Search (SDDS) model, scientific inquiry processes consist of three cognitive components: hypothesis generation, experimentation, and evidence evaluation. The ability to think scientifically includes skills in these three components, but it also requires metacognitive abilities (Kuhn, 2000). The aim of the present study was to investigate (a) childrens metacognitive abilities to identify good and bad scientific reasoning, and (b) the relation between childrens scientific reasoning abilities and their corresponding metacognitive ability. We examined 90 primary school children in two age groups (49 first and 41 third graders). We used three tasks according to the three scientific reasoning components of the SDDS-model. Referring to the three cognitive components, we designed new tasks measuring childrens ability to distinguish good from bad reasoning. The results revealed that children of both age groups performed better in the good reasoning vignettes than in the corresponding bad reasoning vignettes. The relation between these metacognitive abilities and childrens skills in solving scientific reasoning tasks was mostly insignificant. The implications of these results for concepts of science education will be discussed.

**The relationship among implicit processes, on-line and off-line metacognitive monitoring**

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Even though many researchers assume the relation of interdependence between on-line and off-line metacognitive monitoring (Desoete, Roeyers, & Clercq, 2003), it has yet to be elucidated fully what processes serve as basis on the relationship of the above two types of monitoring. Amano & Okamoto (2012) indicated that implicit processes may possibly underlie on-line and off-line monitoring. However, this possibility has not yet been investigated. We examine the relation between on-line and off-line monitoring judgments with the subliminal mere exposure paradigm. The polygons recognition task was consisted of three phases; exposure phase, study phase and recognition phase. In exposure phase, unfamiliar polygons were presented subliminally to participants. In study phase, participants studied exposed and unexposed items one by one for 5sec. During 5 sec, they had to judge whether the item can be recognized in recognition phase (on-line monitoring judgments). In recognition phase, they performed recognition test and predicted their performance (off-line monitoring judgments). The on-line monitoring measure related to the off-line metacognitive monitoring accuracy (r= -.46, p

Metacognition and Mindreading: A developmental study

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The developmental relationship between metacognitive abilities and mindreading abilities is currently hotly debated. One central question concerns whether metacognitive experience can inform mindreading. A recent study by Koriat and Ackerman (2010) showed that adults relied on the memorizing effort heuristic (i.e. that faster studied items are more likely remembered) when evaluating another person’s learning in a judgment of learning task (JoL). Importantly this was only the case when they performed this task themselves before evaluating the Other. This indicates that adults can transfer insight derived from monitoring their own learning to the others, suggesting a relation between metacognitive experiences and mindreading. To investigate whether metacognition and mindreading are closely tied to each other early in development or whether this relationship is a later developmental achievement, we examined n=24 6- to 7-year-olds, n=24 8- to 10-year-olds and n=24 adults in a task following Koriat and Ackerman (2010). We replicated the results that adults can transfer insight derived from monitoring their own learning to another person’s learning (cf. Koriat & Ackerman, 2010). Yet, this was not the case for both groups of elementary school children. This suggests that the relation between metacognitive and mindreading processes is a later
developmental achievement, which is not in place before 10 years of age. We currently examine older age groups of 13- to 16-year-old children and will include these results on the poster.

Using Self-tests to Improve Monitoring Accuracy when Studying Worked Examples in Primary Education

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A student’s own assessment of how well information is learned is called a Judgment of Learning (JOL). JOLs need to be accurate if a student is to make an accurate judgment about what information needs to be restudied or practiced next. Because students often make inaccurate JOLs, it is important to investigate how to improve JOL accuracy. Previous research has almost exclusively focused on word pairs and text. Studies with texts have shown that generation strategies, such as generating keywords, or concept maps, can improve JOL accuracy. The present study investigates whether JOL accuracy when learning to solve problems through worked example study can be improved by self-testing. Fifth graders studied six worked examples, provided immediate or delayed JOLs that were or were not preceded by immediate or delayed self-tests. Although monitoring accuracy did not differ between conditions, it was negatively affected by complexity.

Building Conceptual Vocabulary: The Role of Language Acquisition in Conceptual Understanding

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In our efforts to apply and expand theories of conceptual change to our research in the context of engineering education, we have begun to develop a language-acquisition approach to researching, promoting and discussing conceptual change. This approach builds on existing theoretical and empirical work in conceptual change, as well as our own ongoing research. In our data covering multiple engineering sub-disciplines, students’ consistently struggled to understand and apply concepts named with words familiar from less technical discourse. Drawing on the theories of Chi, Vosniadou and Sδljί we argue that the conceptual task of differentiating these concepts is best understood in the context of language-acquisition.

The impact of goal orientation on the goal type effect

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This study aims at finding out how self-regulated learning with goals provided by teachers is affected by learners’ individual motivational goal orientation. Research on cognitive effects of goals has shown the type of goal learners receive has an effect on their learning outcome. Learning goals result in higher learning outcome as compared to problem solving goals which can be referred as ‘goal type effect’ (Wirth, Kï?nsting & Leutner, 2009). Though, the effect sizes were small but significant. Research on goal orientation has shown learners bring different motivational goals with them to classrooms (Ames & Archer, 1987; Pintrich & Schunk, 1996). Thus, we assume that one reason for the small effect size of the ‘goal type effect’ might be that learners’ individual goal orientation affects their perception of the provided goal, their motivation and learning outcome. Therefore, our research question is to investigate an aptitude-treatment interaction (ATI) between the goal type effect and the goal orientation. One hundred and sixty 14-year old students learned self-regulated within a computer-based learning environment and were provided with different goals. The study followed a 2x2 experimental between-subjects design with goal orientation (mastery vs. performance goal orientation) as quasi-experimental factor and goal type (learning vs. problem solving goal) as experimental factor. We assume that by knowing the possible moderating effect of goal orientation on the goal type effect would help teachers to realize individual differentiation in the classrooms.

(No) Stereotype Threat in Mathematics?

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Since Steele and Aronson’s (1995) introduction of the concept stereotype threat another possible explanation has been that women are aware of the prevalent stereotype asserting that they have low aptitude for mathematics. In this study we will focus on the phenomenon of stereotype threat as an explanation for gender-related performance differences in mathematics and its effect on initial motivation. We will use manipulation instructions to induce (ST, stereotype threat condition) and reduce (ST-I, stereotype threat intervention) stereotype threat in a mathematics task. We assume that the stereotype intervention leads to an increase in female students’ initial motivation, flow-experience and performance. 123 ninth grade students (67 male, 56 female, age M = 14.91; SD = .60) from three high schools, participated in the study. In the ST-I condition students were informed about stereotype threat and its consequences, in the ST condition students were told, that they would be completing a standardized test, in which female students show lower performance than male students. In the control condition participants were presented with a neutral text about memory functions in older adults. Initial motivation was assessed with the questionnaire for current motivation (QCM); flow was assessed with the flow short scale (FKS) and math performance was measured with a math questionnaire. Against our expectations, there was no main effect of instruction on motivation, flow and performance. We found a main effect of gender on motivation and flow. Results will be discussed.

Curiosity, Self-Esteem and Identity Development

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In a study of self-reports from 452 participants (54% female) at a University in the Midwestern U.S., cognitive and sensory curiosity and self-esteem were tested for their links to identity development as measured by The Ego Identity Process Questionnaire and the Extended Measure of Ego Identity Status. After statistically controlling for age, gender, and ethnicity, the hierarchical regression analyses demonstrated that both cognitive and sensory curiosity were significantly associated with identity development, but differentially. Self-esteem was a potent negative predictor of identity development among the participants as well. The regression model explained 4.0-18.0% of the variance in the regression models. MANOVA analyses revealed that non-Caucasians demonstrated greater identity commitment and less identity exploration; male Caucasians older than 20 demonstrated greater identity exploration. The results extend Berlyne’s (1960), Erikson’s (1968), and Harter’s (1990) theoretical notions that curiosity and self-esteem are important contributors to healthy identity development. Educational professionals can use these results to inform efforts to promote optimal learning and development.

Teacher identity: Relationships between ethical orientation, motivation, commitment and self-esteem

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In the educational context there is a consensual idea that identity is dynamic and the identity of the teacher is changing over time. In turn, the field of education and teaching is fundamentally a relational domain where the teacher action plays a key role in training students for global citizenship, with an ethical easily recognizable, as it educates in function of values and by values. Based on the existing literature and investigations conducted under the identity of teachers and teachers’ ethical thinking, we want to know how structural factors of the professional identity of teachers relate to each other - ethical orientation, perception competence, satisfaction of needs (motivation), commitment to the school and to the profession and global self-esteem. We propose a model tested through structural equation modelling (SEM), using data from a sample of 201 Portuguese teachers, 88 male (33.8%) and 133 females (66.2%), aged between 23 and 74 years (M = 41.98, SD = 9.63) and with an average of 15 years of service (SD=8.5). The tested model showed a good fit to data. The analysis of the trajectories established among the factors showed significant weights, allowing us to conclude that the ethical orientation, the perception competence and satisfaction of needs (autonomy and interest/pleasure) play an influential role in the relationship between the factors under study. This preliminary study adds some knowledge for the study of teachers’ professional identity, highlighting the importance of ethical orientation.

The Early Home Learning Study: Supporting parents to provide environments to enhance language skills

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Research shows that the foundations for language and literacy skills are laid in early childhood. In particular, the quality of the early home learning environment and the nature and frequency of parent-child interactions are crucial to child developmental outcomes. This poster will describe the Early Home Learning Study (EHLS) implemented in Victoria, Australia with families in vulnerable circumstances and aimed at improving the quality of the home learning environment, child learning and language outcomes, and parenting well-being. The EHLS (2011-2012) is a large-scale randomized controlled trial involving 2,000 families. Delivery of the intervention involves video modeling, practice with feedback, and didactic materials. The intervention activities are focused on two domains: quality everyday interactions and a stimulating family environment. The intervention also addressed
parents’ own well-being with a focus on two domains: self-care and personal agency. Pre to post findings for this early intervention study are presented. Full sample data showed excellent reach (>80% of participants reported 1 or more vulnerabilities), attendance (mean attendance >70% of group sessions; >90% home coaching sessions), and retention (>75% participated in 5 month follow-ups). Preliminary pre/post data indicated changes on key measures: home learning environment and parent responsiveness. Full trial data will test for the differential effectiveness of the intervention formats.

**Class size and students’ need for support. Impact of a reform in the Finnish comprehensive school**

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Despite the fact that class size is one of the most researched questions in education, the results are inconsistent. Yet, class size reduction is the most often proposed solution to today’s educational problems, also in Finland. Due to the challenges schools are encountering in the form of increasing student heterogeneity, including students with special needs, demands for reducing class size by stipulating a maximum by law have been raised. In 2011, a reform of education legislation regarding special education took place in Finland. The reform emphasizes that in the three-tier model also students receiving intensified or special support (ISS) should be taught in regular classes. The aim of this study is to explore the actual class sizes in the Finnish comprehensive schools; the impact ISS-students have on class size; and what other means are in use to secure their intended support. The representative sample data were collected by questionnaires in lower secondary (N=65) and primary schools (N=300). The preliminary results indicate that the number of ISS-students does not affect class size in lower secondary classes while the number of ISS-students in regular classes varies from 0 to 10 in classes with a mean class size of 18.7. In some schools, co-teaching has been introduced to add support to the ISS-students, but the results point to a danger of growing differences in the support ISS-students are offered, depending on the resources and decisions of the school they attend.

**Teacher-Student Relationships across the Early School Years for Children with Developmental Delays**

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The transition from early intervention programs to inclusive school settings presents children with developmental delays and disabilities with a range of social and learning challenges. The study is tracking cohorts of children with developmental disabilities from recruitment in the year in which they commence school (Prep) and across the next two years. This poster presents data from the Transition to School Project. Data was collected through parent phone interviews, teacher questionnaires and direct child assessments. Research questions addressed are: What is the quality of the teacher-student relationship between teachers and young children with developmental disabilities in the early years of school (Prep to Year 2)? Is there a relationship between relationship quality and cognitive ability or other child characteristics across the early years of school? Can differences in relationship quality be accounted for by children’s behavioral and social competence across time? Results indicated that the most important predictor of children’s relationship with their teachers was their social competence in Prep and also in Year 1. High levels of prosocial behavior and low levels of problem behavior predicted a close teacher-student relationship and conversely, low levels of prosocial behavior and high levels of problem behavior predicted a poorer teacher-child relationship. The findings to-date suggest that children’s relationships with their teachers were unrelated to their degree of disability or ability to cope with academic demands and solely dependent on their behavior within the classroom.

Cognitive Stimulation in Early Childhood at Parental Homes

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In early childhood, cognitive development is likely influenced by the quality of home learning environments. Therefore, there is a huge potential in parent training, but a lack of empirical evidence. Our intervention study is based on an experimental design with randomized allocation of 200 parent-child-dyads (children aged two to three) to 3 treatment groups and 1 control group. Parents are trained in cognitive stimulation (EG1), emotional sensitivity (EG2), and a combination of both (EG3). The effects are investigated on parent and child level applying questionnaires, and (development) tests as well as collecting video-data. Parents in the EGs are expected to show higher gains in the dependent variables as compared to parents in the CG. Children of trained parents are expected to develop better than their prognosis. Initial results will be available in summer 2013.

Being a teacher of a child with special educational needs: a rewarding but challenging experience
The modern teacher has to face complex situations requiring competence, thought and creative ability. From previous research (Cardarello et. al. 2009, 2011; Antonietti et. al. 2010), which aimed at looking into teachers’ professionalism and starting from the teachers’ vision of their own profession, it emerged how teaching and the relationship with children with special educational needs in inclusive school context represent a sizeable challenge for the teachers themselves. Such results are confirmed in the Italian literature in this particular field. Starting from this data we shall analyse a corpus of 500 autobiographical essays written by 250 Italian preschool and primary school teachers regarding the satisfaction and the problems that go with the profession. In particular within this corpus, through an analysis of the contents, we intend to isolate the episodes dealing with encounters involving children with special educational needs in order to pinpoint the areas of the teaching profession involved the key issues already documented and the resources adopted to handle a situation perceived to be problematic. The results will be linked with the literature on teachers’ problems and with previous research on the same theme.

Modeling Entrepreneurial Competence: Challenges and Contradictions in the Business Planning Process

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Many studies have highlighted the fundamental role of entrepreneurship and innovation (e. g. Sheshinski, Strom & Baumol, 2007). Regularly published reports like the Global Entrepreneurship Monitor (GEM) and politically initiated support measures (e. g. EXIST in Germany) are expressions of a growing public interest. Furthermore, entrepreneurial competence has been declared as a key competence of lifelong learning throughout the EU (European Commission, 2007). Entrepreneurship education has become a big topic in the national and international economic education landscape. As a consequence, various entrepreneurship education initiatives were developed in recent years (Kuratko, 2005). An important aspect and crucial prerequisite for teaching and assessing entrepreneurial competence is to model it. Following Weinerts (2002) holistic definition of competencies, our goal is to analyze the challenges and contradictions in the business planning process. For that purpose, we consider Engeström’s (1987) activity system as a heuristic and practical descriptive framework. To reveal group-specific peculiarities regarding different expertise degrees, we highlight the entrepreneurial challenges and underlying contradictions from different perspectives. The pre-study includes a review of the relevant literature on this topic and the implementation of expert interviews. A content analysis is applied to analyze the data (Mayring, 2010). In the main study, we use that information as basis for questioning larger groups of students,
entrepreneurs and entrepreneurship experts. In order to grasp the effects of different degrees of expertise, we utilize the contrastive approach/comparative analysis (Gruber, Palonen, Rehrl & Lehtinen, 2007).

Testing the expectancy-value model in mandatory training enrolment among jobseekers and employees

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In a context of labour market instability, continuing professional education is becoming ever more important for employees and jobseekers’ professional career (Conter, Maroy, & Urger, 1999). In some cases, the participation is constrained. In Belgium, unemployed people can not refuse an adequate job or training. Among the unemployed population, an estimated 25% do not enrol in training on their own willingness (Conter, Maroy, & Orianne, 2003). The researchers agree to point out that the answer to this question ‘Do I want to do the course?’ is determinant for the learners’ engagement in learning tasks (Eccles, 2006). It is, therefore, all the more important that we aspire to better understand the personal goals that these individuals strive for and the impact of these goals on their motivation. The situational factors can also influence their motivation and indirectly their engagement. We use the expectancy-value models (Eccles & Wigfield, 2002) to explore theses issues. Specifically, our research aims at investigating whether adult learners’ motivation and engagement increased over time in a constrained training context and under which circumstances. One explanation could be found in teaching practices. We also aim at comparing the motivational profiles of employees and jobseekers. The research is on its preliminary stages. The theoretical framework and the methodology on the planned research project including several studies will be presented.

Team learning in elder care nursing

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Teamwork is a relevant factor for organizational learning in different professional domains because it is assumed that it is a key factor for managing the continuously changing environment. Today teams in elder care nursing are supposed to ensure high standards of quality and face a dynamic field of work. In order to accomplish work tasks in a productive and innovative way they have to exchange information and develop solutions in social cooperation. Theories on workplace learning and collaborative learning emphasize cognitive and social processes that influence individual learning in groups and integration and coordination of knowledge at team level. Collective knowledge and cognition can be conceptualized as team mental models which refer to the overlapping mental
representation of knowledge by members of a team regarding relevant team and task factors. In this study we want to identify relevant cognitive and social aspects that enable learning activities within a team including interpersonal, organizational and individual contexts. We also focus on the measurement of team mental models in order to measure group-level cognitive structures with regard to a specific work domain. In the presentation we want to give more information on the theoretical basis, research design and present the results of our study. We also want to elaborate on the interpretation and implications of the results regarding the further research process and practical implementation.

Premature apprenticeship contract terminations – the role and impact of organisational climate

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The Swiss VET system is organized in a so called ‘Dual System’, where the trainees have an apprenticeship contract with the companies. Each year up to 25% of those contracts are terminated prematurely. Contract terminations are associated with high costs for society, the company, and the young people. A decrease of premature contract terminations (PCT) is therefore highly desirable. The reasons of a PCT have primarily been explored in studies with a focus on the trainees. Some empirical hints for the influence of the organisational climate for PCT come from studies, which ask trainees for the reasons of PCT. The aim of this study is to identify the influence of the organisational climate on PCT. The leading research questions are: (1) Does the organisational climate of training companies with PCT differ from the organisational climate of training companies without PCT? (2) Are there domain-specific differences in the organisational climate of training companies (cooks vs. painters)? (3) Which aspects of the organisational climate are associated with PCT? (4) Is the effect of the organisational climate on PCT mediated through the motivation and job satisfaction of the trainer as well as the trainers professional behaviour? The representative sample of this cross-sectional study consists of 800 training companies for cooks and for painters in Switzerland, 400 of which with and 400 without PCT in the recent past. Surveys based on half-standardized questionnaires are conducted with trainers.

Diagnosing medical images: What the eyes tell us

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Research on expertise revealed that experts’ ability to process domain-specific information fast and more accurate than less skilled subjects is based on differences even in the perception of stimuli. Experts encode meaningful patterns rather than isolated items, and thus they are able to process information differently. A study is presented in which the nature of expertise in the domain of radiology is analysed. So far, the study compared a total of 35 subjects of four different levels of expertise while scanning CT slice images: controls, novices, semi-experts, and experts. Eye-tracking technology was used to analyse subjects’ visual information processes. The subjects had to study
authentic CT slice images of three levels of difficulty and to decide whether a pathological finding was present. The following parameters are measured: duration of fixations, dwell time in relevant areas, time until first fixation in relevant area, hit rate, duration of inspection of images. In addition, qualitative data on diagnostic accuracy is collected. We expect to find expertise-related differences in the eye-movements and decision-making. As data collection is still in progress, analyses and results are preliminary. A significant effect was found for duration of inspection. Experts were faster than the other groups and excelled in diagnostic accuracy. At the conference, the results will be discussed to contribute to our understanding of how eye-tracking technologies can be used as tool to assess and, in the long run, to support individuals in the acquisition of expertise in diagnosing medical images.

**Measuring the effects of instructional development programs for teachers in higher education**

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Due to the lack of systematic evaluation data on the effects of instructional development programs in higher education, the impact of such programs on the teachers and their teaching behavior remains mostly unclear. The present poster addresses this shortage by presenting a comprehensive evaluation framework, combining different aspects and methodological approaches to investigate the effects of two systematic instructional development programs recently introduced at a German University. The framework aims at evaluating the programs on a variety of different outcome levels, referring to Kirkpatrick’s (2006) classic model of educational outcomes. The poster presents first results of the evaluation at levels 1 reaction (participants’ perceptions of the educational experience) and 2 learning (changes in the participants’ attitudes, knowledge and skills). We will discuss the findings with regard to possible moderating effects of variables such as the participants’ disciplines. Moreover, implications for further improvements of the programs will be discussed.

Relationships between achievement goals and two types of social comparison in Japanese middle-school

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Achievement goal theory posits that social comparison is correlated with performance goals but not with mastery goals (Elliot & McGregor, 2001). In contrast, a study by Darnon, Dompnier, Gilliand, and Butera (2010) correlated both performance and mastery goals with social comparison. In this study, we explored two types of social comparison (Toyama, 2007): learning comparison and performance comparison. Our hypothesis was that mastery approach goals would be associated with learning comparison, while performance goals would be associated with both learning comparison and performance comparison. Social comparison is associated not only with goals but also with two types of motivation: mastery oriented and performance oriented in an experimental context (Butler, 1995). The second aim of this study was to examine whether both goals and motives are associated with social comparison in classroom situations. Two hundred and eighty-seven Japanese middle-school students took part in this study (age range 12-14; 133 girls and 154 boys). Participants completed a self-report survey assessing their achievement goals, achievement motives, and social-comparison behavior. Regression analyses showed that mastery approach goals are associated only with learning comparisons. The second aim of result showed that learning comparison is associated with both goals and motives. It corresponded to Butler’s (1995) finding, indicating that her findings are applicable to classroom situations.

Teachers’ Situation-specific Self-Efficacy: Lesson, Student Group and Teacher Effects

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Most previous research on teachers’ self-efficacy has focused on individual differences, while less attention has been paid to situational effects. We investigated the variability of, and effects of lesson
characteristics (e.g., lesson sequence, student engagement), student-group characteristics (e.g., proportion of students receiving free school meals) and teacher characteristics (e.g., teacher experience) on teachers’ situation-specific self-efficacy. Forty-three teachers reported on 962 lessons in 345 student groups, using electronic questionnaires in Personal Digital Assistants (PDAs) during a period of two weeks. Multilevel structural equation models (MSEM) suggested two domains of teachers’ self-efficacy (to support learning and classroom organization) and two domains of perceived student engagement (motivation and behavior). Student-group characteristics predicted self-efficacy to organize classrooms. Perceived student motivational engagement was more predictive of teacher self-efficacy than perceived student behavioral engagement. More experienced teachers felt more efficacious. The findings have implications for our understanding of teachers’ everyday practice with different student groups.

Effects of Knowledge about Strategy and Perceived Utility about Strategy Use

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Cognitive factors seem to facilitate the frequency of the use of appropriate learning strategy in learning. Having knowledge about the strategy and perceived utility of the strategy are both cognitive factors which can be effect on the strategy use, but they are not the same condition. However, only a few studies have investigated the effects of those cognitive factors in learning. Therefore, the purpose of this study is to clarify the influence of cognitive factors on strategy use. Present study clarifies the influence of knowledge and perceived utility item by item, because it is thought that having knowledge or not is different among learner individuals item by item. The survey was carried out to 189 Japanese undergraduate students. Participants asked to answer the questions (28 items) from 4 different perspectives; strategy use, knowledge about strategy, perceived utility and perceived cost. The analysis was performed item by item, but an effect shown as a result of analysis may be different at the individuals. Therefore, this study used multilevel analysis that is included items into individuals. As a result of analysis, influence of knowledge about strategy was strong, and the interaction with the perceived utility was seen (p Keywords: learning strategies; knowledge about strategy; perceived utility).

Hearing-impaired students’ arithmetic word problem solving: Evidence from eye movements

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Previous studies have constantly confirmed that most students performed very poorly on arithmetic word problems, especially on those problems containing relational statements comparing the quantities of different variables. Moreover, in the compare problem contexts, students’ performances differed considerably when the required arithmetic operation to solve the problem was consistent or inconsistent with the relational term. In addition, the existence of irrelevance information also greatly increased the difficulty when solving arithmetic word problems. In this study, we investigated how hearing-impaired students solved the arithmetic word problems with/out the consistency effect and relevancy effect using the accuracy rate as well as their eye movements. The participants were asked to solve eight arithmetic word problems which were designed based on four combinations of consistency and relevancy effects. The materials were presented using GAZETRACKER 8.0 on a computer. The results showed that the inconsistent problem with extraneous information was, as predicted, performed the worst, followed by the inconsistent-only one and the one with extraneous information respectively. Looking carefully at the effect of different class settings, participants from the integrated classes performed significantly better than those from the special classes. The eye movement data showed that these hearing-impaired students spent much more time reading the number and keywords than the variable on all the problems, suggesting they were exclusively using the direct-translation approach to solve the problems. In addition, these participants reread the irrelevant information and thus it appears that they had difficulties discriminating the useful information from the irrelevant one. More details and discussions will be presented in the conference.

Supra-segmental processing and literacy development

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Supra-segmental processing has been found to predict literacy development. In the German language, a relevant component of supra-segmental processing is stress identification. Stress not only specifies a word’s phonological form but is also associated with vowel length markers. This study therefore investigated whether the ability to identify stress is not only related to reading and spelling development but also more specifically to the acquisition of vowel length markers. Participants were 24 third- and fourth-graders. In a speech rhythm task, non-verbal beat rhythms were presented and children had to choose a sentence that fitted a beat rhythm in that stressed syllables could be synchronized with strong beats. Performances in this task correlated with reading and spelling skills and more specifically with the acquisition of vowel length markers. The results suggest that supra-segmental processing is relevant during literacy development and besides syllabification, it might be important to train children’s ability to work out the stress pattern of words, especially in the orthographic stage.
Online-based support of self-efficacy in vocational education. An experimental field study

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In the context of vocational education failures are a well-know problem. In this domain a very heterogeneous composition of students has to be taught simultaneously. This can cause disadvantages and unsuccessful situations for weaker learners. Failures can weaken the learners’ self-efficacy beliefs, especially when combined with inappropriate causal attributions. This may lead to an increasing probability of unsuccessful learning situations. Building on previous research, we tried to counter these problems by giving attributional feedback especially beneficial to perceived self-efficacy. Subjects of the present experimental field study are N=294 students enrolled in vocational education. By using a weekly online learning report and pre-/post-test questionnaires it is examined (a) how giving a special attributional feedback during self-regulated learning processes influences self-efficacy beliefs and (b) how the amount of perceived success/failure during the goal attainment process impacts the relation between attributional feedback and self-efficacy beliefs. All participants were asked to set a learning goal. During the following six-week goal attainment process a part of the sample received individual e-mail feedback based on the online learning reports. We implemented experimental variations of this feedback which were intended to support causal attributions beneficial to the learners’ perceived self-efficacy in different degrees. The first group received attributional feedback especially tailored to support self-efficacy beliefs, the second group received general feedback intended to be non-attributional, and a control group received no feedback. Preliminary findings suggest perceived success/failure to be a possible moderator in the relationship between attributional feedback and self-efficacy beliefs. Further analyses are in progress.

How learners use digital technology for academic and social purposes in the digital era

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In most developed countries, teenagers intensively use digital technology, especially the Internet (Ben-David Kolikant, 2010: 1384). Most of these students, who were born roughly between 1980 and 1994 (Oblinger & Oblinger, 2005), represent the first generations to grow up with this new
technology and have been characterized by their familiarity and confidence with respect to the ICT. Some claim this has resulted in a different worldview in students, generated new skills and competences, and has affected the students' social and academic life. Technology is integral to the way they live, think, communicate, and the way they work (Simoneaux & Stroud, 2010: 67), but they are using these technologies primarily for social and entertainment purposes. The aim of this study was to understand how learners use digital technology for academic and social purposes. The study will be conducted from the interpretivist paradigm and use qualitative research methodology. The research is designed as a mixed methods study. Data will be collected using an online questionnaire developed by Bullen et al. (2008) focussed on the student communication and study habits of first-year students of the Pedagogy, Social education, Early education and Primary education and through face to face interviews with a sample of students. Results show that students generally prefer personal email, face to face interaction, social networks and mobile cellphone to communicate and connect with others. Regarding study habits, students prefer to learn by themselves, and used to perform various tasks simultaneously.

Impact of handwriting automaticity and speed in children

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In order to investigate the automaticity of handwriting in children and the impact of fluent handwriting on higher order processes of text production, this cross-sectional study aimed (1) to construct a model of handwriting automaticity in children and (2) to explore the associations between handwriting speed and automaticity, on the one hand, and visual-motor integration and orthographic skills, on the other hand. In a Swiss sample of 93 fourth graders (Mean age = 10 years and 7 months; SD = 6.58 months) handwriting speed and legibility were assessed by means of a copying task. Furthermore, automaticity of handwriting, stroke pressure and stroke frequency were measured on a digitizing tablet, while visual-motor integration and orthographic skills were assessed by means of standardized tests. SEM modelling revealed that automaticity of handwriting, which is both associated with stroke frequency and stroke pressure, predicts handwriting speed and orthographic skills. A hierarchical regression analysis indicated that handwriting speed is a reliable predictor of orthographic skills besides visual-motor integration. Results are discussed with respect to theories assuming associations between automaticity of handwriting and saving of cognitive resources.

How homework variables influence into academic achievement across compulsory education

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Although homework is one of the most well-known and used instructional strategies all over the educational world it keeps on being a controversial and complex issue. The present investigation examines the relation between some homework (HW) variables (i.e., amount of HW completed, time spent on HW, and HW time optimization) and academic achievement, after controlling for students’ gender and grade level. Participants were 454 students (10 to 16 years old) from three schools in northern Spain. A MANOVA and path analyses showed that the amount of HW completed decreases along schooling, as does students’ perception of HW time optimization. Data from hierarchical regression analyses completed by path analyses provided evidence that time spent on HW conjointly with HW time optimization explain academic achievement mediated by the amount of HW completed. These findings deepen the understanding of the complex role of time spent on HW and its impact on academic achievement.

Primary school teachers’ views on text quality, writing education and their classroom practices

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Abstract (227 words) A research report written by the Inspectorate of Education in 2010 indicates that writing education in Dutch primary schools is of low quality. Yet, from educational research ingredients for effective writing lessons are known. Educational designers and researchers want to offer writing education in grade 4 and 5 a sustainable impulse. In the research and development project new writing lessons will be designed and connected to a popular reading method. The writing assignments focus, like the reading programme, on the acquisition of strategies. Effects are studied by following 80 teachers over a period of two years. The majority of the teachers that participate will be trained. One of the instruments that will be used is a stimulated recall interview. Teachers will be asked to bring along two writing products of their students. This writing assignment will be used as input to talk about one of their writing lessons and the texts to talk about text quality. The aim of the teacher interviews is to get insight into the writing classroom practices of the teachers who participate in the project, into their views on writing education and text quality and the relation between teaching practice and teacher beliefs. We are also interested in what teachers perceive as
Learning to read and write is essential for every child, and because of the critical role that language development has in literacy development the role of bilingualism in the development of reading and writing skills has been debated. By necessity, many studies on bilingualism draw their participants from migrant communities that are likely to be socially marginalised. Thus linguistic factors can easily be confounded with socio-economic factors. In this paper we investigate the interplay between language and literacy skills in a group of bilingual primary school children who are not as a group socio-economically disadvantaged, i.e. Finnish-Swedish children. In a longitudinal project from preschool to third grade 69 children from 6 Swedish schools in various Finland-Swedish areas were assessed for metalinguistic skills, oral language skills, and literacy skills. The sample consists of both monolingual Swedish and bilingual Finnish-Swedish children, some of them from more or less monolingual Finnish homes. Children from predominantly Swedish-speaking homes scored higher than children from predominantly Finnish-speaking homes on Swedish-language tests and vice versa but in general no large differences between the groups were found except for spontaneous writing. The children displayed very different writing processes. Compared to the other writers the ‘Finnish-speaking’ children were slow and made many revisions in their Swedish writing. The content of the revisions is currently being analysed and will be in focus on our poster. From an educational point of view the results illustrate how process data add important pieces of information to the assessment of children’s language skills.

School Social Work: Ethnographic research on practice-oriented challenges

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Over the past four decades school social work has developed as a new and diverse educational working field. Most studies in the fields of professional approach in school social work focus on the collaboration between teachers and school social workers. In contrast, this study explores field-specific types of professional work in the interactions of school social workers with pupils. Field research was carried out in a secondary school by conducting participant observation and ethnographic interviews. Reconstructed from an ethnographical perspective is how school social work is created by the participants (pupils and school social workers) in social practices (see Reckwitz 2003), to expose embedded practical challenges and how the professionals deal with them. The data analysis is based on the coding process in the Grounded Theory method. Results suggest that the practice of school social work only partially corresponds with education policy demands for models of school social work, that are integrated in the school system (see Maykus 2011). Instead of close
collaboration between school social workers and teachers, pupils are the main target group. This has a beneficial effect on the relationship of trust with pupils and emphasized the importance of the independent position (see Baier/Heeg 2011). School social work is constituted as an experiential space for pupils and as very different space for their everyday challenges within school, but with diverse references to individual schools.

**Is there evidence for expertise on collaboration and if so, is it domain-specific or domain-general**

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Experts in other domains, like chess or sports has also been proven to have elaborated procedural knowledge, which is called a script. These internal scripts can contain highly organized and elaborated, yet flexible procedural knowledge. With this research we try to answer whether there is evidence for expertise on collaboration and if so whether it is domain-specific or domain-general? If there is expertise on collaboration the retrieval of a rich internal collaboration script should be differentiable from the retrieval of not yet as elaborated knowledge of novices. In two studies collaborative experts and novices of academia and medicine were confronted with stimuli of a collaborative setting in which people were involved in a collaborative activity. Stimuli differed regarding of the same vs other content domain as the subject, thus testing for domain-specificity. The subjects were asked recall questions (What did you see on the picture/video?) or script questions (What has most likely led to the situation? What happens in the situation? What is most likely to happen next in the situation?). The answers were coded with a coding scheme largely derived from the conceptual analysis of collaboration scripts by Kollar, Fischer, Hesse (2006). There is evidence for the existence of expertise on collaboration as the results show that experts retrieve more script-like information overall. The difference was only significant for stimuli regarding the same content domain, thus indicating domain-specificity. Research seems very promising, especially domain specificity of scripted collaborative knowledge should be further investigated.

**Good Questions or Good Questioning: Researching Teachers’ Questioning Practice**

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Those interested in mathematics education have long recognized the value of asking good questions. We assume that good teachers ask good (and lots of) questions of their students. Yet this general recommendation fails to consider important considerations concerning how teachers implement question-asking. The purpose of this study is to think more deeply about the nature and implementation of this important practice. We explore question-asking in mathematics classrooms by presenting two case studies, which involved two teachers teaching the same topic to two different classes. We describe how these teachers implemented question asking, both in the context of the teachers’ usual curriculum, which did not put a premium on question asking, as well as through the use of curriculum supplements that focused explicitly on question asking. Comparison of the two cases highlights important differences between ‘good questions’ and ‘good teacher questioning practice.’ Our analysis suggests that good questions cannot be meaningfully considered or promoted independent of good questioning practice and that this distinction has significant implications for teacher professional development.

Assessing teacher’s interpersonal behavior in the German physics classroom

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The linkage between teachers’ behavior and students’ outcomes is topic of many discussions in the field of educational sciences. Educational efficiency is based on interpersonal interaction of both: students and teachers. The Questionnaire on Teacher Interaction (QTI) is an established measurement-instrument to assess teacher interpersonal behavior as perceived by students and teachers. In the present study we investigated whether the QTI is applicable in the German school context as well as it is in many other countries (Wubbels et al., 2006). Therefore we used teachers’ and students’ answers on a translated version of QTI to investigate the distribution of German teachers’ interpersonal profiles and to constitute correlations between students’ perceptions of their teachers’ interpersonal behavior and students’ grades. Participants were 24 German physics teachers with two parallel classes (in total: 1,249 eighth graders). The results show that the German version of the QTI seem to work well within this sample because we were able to show non-significant differences on QTI-values of two classes rating one teacher. Our results, however, are contrary to earlier findings as we did not find any dependence on teachers’ seniority. In teachers’ and students’ perceptions the participating teachers displayed an authoritative to tolerant-authoritative profile. In line with theoretical assumptions (denBrok et al., 2004) teachers in our sample tend to rate themselves in a more desirable way. Concomitant with our findings, we assume that the QTI can be used as a valuable measurement-instrument in the German school context.
Culturally-specific aspects of quality in childcare settings: Learning through collaborative play

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The purpose of this study was to examine the relationship between classroom quality characteristics, collaborative play behaviour and the cognitive complexity of play of children in culturally diverse early childhood education and care settings in the Netherlands. By doing this, the current study aims to increase both the cultural sensitivity of existing quality models as well as the information on peer interactions and caregivers’ role in these interactions (Burchinal, 2010). For this purpose caregivers and children in 64 child care centres and preschools were videotaped in a pretend play setting. Classroom quality was measured using the Classroom Assessment Scoring System (CLASS; Pianta, La Paro, & Hamre, 2008). Observational measures were used to assess caregivers’ support of group processes, children’s collaborative play and cognitive complexity of play. Preliminary findings show relations between caregivers’ support of group processes and collaborative play of children. Findings also show relations between collaborative play and cognitive complexity of play for children of diverse cultural backgrounds and ages. The observation scales provide further insight into caregivers’ role in peer interactions. These results indicate that caregivers’ support of group processes is an important measure of classroom quality and should be added to existing quality measures such as the CLASS. Supporting group processes increases children’s collaborative play and this collaborative play is important for the levels of complexity of play.

Supportive and nonsupportive forms of motivational discourse in problem solving classrooms

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This paper analyzes the supportive and nonsupportive forms of motivational discourse of 10 primary education teachers. For the analysis we used the discourse codes employed in previous work in matematic. That the results suggest most of the motivational discourse of teachers is supportive but also, closer analysis leads to the conclusion that although forms of supportive messages fall upon superficial elements of the motivational process. These results open the way to new questions: there are different degrees or levels of supportive forms of motivational discourse? What are the implications for the learning?

Collective learning as tool for promoting the implementation of Assessment for Learning practice

Diana Baas
The role of collective learning in the development of teachers’ competencies is widely acknowledged. Collective learning aims at the improvement of students’ learning by developing relevant teacher competencies. It is characterized by an inquiry based cyclic approach in which a collective ambition is defined, information is collected and interpreted and actions are taken based on the derived consequences. In this respect, the process of collective learning resembles the inquiry approach central to Assessment for Learning (AfL). Collaborative learning at the organizational level is hypothesized to serve as a tool to promote the implementation of AfL in classrooms. This study investigates how a professional development trajectory focused on stimulating collective learning in elementary schools, contributes to the implementation of AfL. Six Dutch elementary schools participated in this research. Collective learning is stimulated by organizing four off-site meetings and one on-site meeting. Qualitative data on the process of collective learning and teachers’ perceptions of the implementation of AfL were gathered. Furthermore, quantitative data are gathered to determine the extent to which AfL is actually implemented in classrooms. This round table will discuss the preliminary results regarding the relation between collective learning processes in the schools and its outcomes in terms of implementation of AfL. Furthermore, the question is addressed what implications can be derived from these results regarding the design of professional development trajectories for teachers.

The effects of neuroscience literacy on primary teachers’ attitudes towards learning and teaching

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This round table session discusses the relation between teachers’ neuroscience literacy and their professional development and quality of teaching. Current literature on educational neuroscience often assumes neuroscience knowledge will make better teachers but does not speculate about the mechanisms that underlie these hypothesised effects. On the basis of the results of an explorative research project a discussion will be initiated about the possible mechanisms by which increased knowledge about the brain improves the quality of teachers. This qualitative, explorative research study investigates self-perceived changes in attitude towards and views about learning, teaching, children’s thinking and talent development of 124 Dutch primary teachers after participating in a Brain & Education workshop. Furthermore, 8 primary teachers were interviewed before, during, and after they developed and taught a neuroscience lesson series in their own classroom. This study is approaching the gap between neuroscience and education from the teachers side. The results of the study and outcomes of the round table discussion will have implications for the advancement of the field of educational neuroscience.

Perceptions of risk for teachers in professional learning for instructional improvement

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Risk and uncertainty are inherent in educational change. This mixed methods study investigated perceptions of risk for teachers engaged in professional learning for instructional improvement. Questionnaire data indicate that the practice teachers perceive to be highest risk and are least willing to engage in is changing assessment and/or teaching practices. This is an important finding given that the intention of most professional learning initiatives is to indeed do this. The practice teachers considered the lowest risk and which they were the most willing to do was analysing and using student outcomes data with others. There was a significant difference in the way school leaders and professional development facilitators rated teachers perceptions of risk and willingness to engage in questioning the beliefs and practices of others to the ratings teachers gave. The data indicate that teachers see questioning others beliefs as a risk and leaders and facilitators are not aware of this. Qualitative analysis based on follow up interview data with teachers, leaders and professional developers provides further information in terms of the reasons behind perceptions of risk and possible actions that might support teachers in risk-taking.

Early Childhood Teachers’ Practical Knowledge about Teaching Language and Literacy

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This research aims to examine practical knowledge evidenced by student early childhood teachers in their last year of preparation about teaching language and early literacy to children from 0-6, describing its relationship with the quality of early childhood teacher preparation programs. The conceptual framework of this research relies on the concept of practical knowledge, which refers to the cognitions that underlie to teachers’ actions, including teachers’ knowledge and beliefs and interactive cognitions. This is a 3-year descriptive research that uses a mixed method design, including quantitative and qualitative methods, which are triangulated in order to secure internal validity. Participants in this research are early childhood student teachers in their last year of preparation. The research sample will be drawn from 15 preparation programs of both high-quality and low-quality. This research is relevant because it inaugurates for Chile a research strand focused on teachers’ practical knowledge. Furthermore, this research expands international evidence on teachers’ practical knowledge, to include early childhood education, which has not been examined before. This research has currently completed its first year of execution. During 2012, the data collection instruments have been validated through a pilot study where 30 students from two programs, different in their quality, have been examined. Results evidence differences among students’ practical knowledge about teaching language and early literacy that can be related to differences in the quality of the programs examined.

The Impact of Organisation on the Development of Students’ Competences

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most of all. This Round Table Session will be devoted to introducing a survey design aimed at identifying competences which can be derived from the organisational form of tertiary education. For this purpose, various master and bachelor programmes in the area of Business Studies offered at universities and universities of applied science will be compared. The survey will compare the self-evaluation of graduates and their employers’ assessment of their competences (gathered via guided interviews). The goal is to encourage universities to focus their attention not only on qualification but also on their own structures and procedures.

Dealing with Learning Disabilities in the Classroom: The Teacher’s Point of View

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Access to education on an equal basis is one of the cornerstones of human rights. The concept of inclusion in education is associated with the concept of equality, and consists of the school’s ability
to take charge of all pupils with special needs. In particular we refer herein to specific Learning Disabilities (LD). This acronym refers to a heterogeneous group of disorders that occur with significant difficulties in the acquisition and use of skills involving linguistic expression, reading and writing and calculation (DSM-IV). In these cases may be useful reasoning in terms of functioning, describing in an analytical manner the functioning of a subject, both their functional defects and their potential, and capacity (ICF model). Objective of this work is an in-depth exploration of the practices that teachers use in their training at school, making a first reflection on the opportunity to work with a functional profile of the subjects. This work concerns a reconnaissance phase of 31 teachers’ practices The method used was the focus group. This allows for one to ‘pick up’ strategies that can be used in a class for the effective management of LD, but considering them simultaneously in a dynamic form, which is closely related to the conditions that favour or hinder, fielded the same strategies.

**Debilitating Performance Anxiety in Simulation Environments: A Systematic Literature Review**

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Simulations are used increasingly in health education to validate a candidate’s ability to apply their knowledge and critical reasoning to complex health care situations. This type of activity can induce significant performance anxiety in many students. According to the literature, debilitating performance anxiety follows a catastrophic model in which, a person’s performance steadily increases with moderate levels of anxiety then plummets when a level of excessive anxiety is reached. The aim of this review was to explore the phenomena of performance-based anxiety during clinical simulations using the available empirical evidence in order to demonstrate the impact of the affective domain on clinical reasoning in simulation environments. The systematic review of literature was performed using the keywords: ‘performance’, ‘anxiety’ and ‘simulation’ between the years 2002 to 2012. This elicited a total of 152 articles, 14 of which fit the inclusion criteria. The inclusion criteria were studies published in French or English that measure or explore the phenomena of anxiety during clinical simulations or in realistic simulations of time-limited emergency events occurring in workplace environments. This review revealed that anxiety was prevalent in the majority of participants involved in simulation and that it could have a marked impact on performance.

**Writing Beliefs and Revision: A Phenomenological Study**

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This study examined whether an exercise in revision can alter students’ beliefs about writing, specifically revision. Ninety-two undergraduates revised papers they had written for a class. Students received an overall grade, feedback on their substantive and mechanical writing skills, and a marked up copy of their paper. Students made the corrections to their papers and wrote a paragraph in which they described what they did, compared their revision to their original paper, and reflected on their experience. A phenomenological analysis of their statements revealed 29 themes which were placed in 7 categories. Results indicated that the students had developed a more positive and more nuanced view of revision. Many increased their belief that writing is an iterative process.
CPD from a systemic point of view: the German Center for Mathematics Teacher Education (DZLM)

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In 2011, the Deutsche Telekom Stiftung launched the German Center for Mathematics Teacher Education (DZLM) to contribute comprehensively to mathematics teachers’ CPD. A consortium of eight institutions that combine research expertise from the fields of mathematics, mathematics education and the educational sciences has established the DZLM. The main objective of the DZLM is to approach CPD from a systemic point of view, following NCETM (England), IUS (Austria), and NCM (Sweden). The DZLM aims at implementing a cascade of CPD. In this respect, the training of mentor teachers is considered a core issue, as it is important how they are enabled to pass on their in-depth knowledge and expertise to fellow teachers. Second core issues are qualification programs for out-of-field teachers. Another activity concentrates on empowering teacher inquiry and research through supporting local teacher working groups and networks. In this presentation, the training programs for mentor teachers are specified to outline the Center’s conception of CPD activities.

The research program of the German Center for Mathematics Teacher Education (DZLM)

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A continuous internal evaluation of all CPD activities is carried out through surveys. 2) The effectiveness of interventions to foster CPD is examined through design-based research. 3) The relationship of the CPD activities to the mathematics teachers’ professional knowledge, their performance in class, and to student achievement (especially under the condition of inclusive groups) is examined. Building on a model of professional competencies as applied in MT21, TEDS-M and COACTIV (Blomeke, Kaiser & Lehmann, 2008; Baumert et al., 2010; Kunter et al., 2011), groups of teachers are surveyed on their beliefs and tested on their content knowledge, pedagogical content knowledge and general pedagogical knowledge prior, during and past a CPD. 4) Lesson studies to foster CPD and to recruit Ph.D. students are initiated and supported. Lesson studies were firstly introduced after the TIMSS 1995 video study as a tool to examine collaboratively as a group of teachers one’s own mathematics lessons in order to improve teaching performance and to teach more effectively (Lewis, 2002). Examples for all four parts of the research program will be presented conceptually and empirically with results from the first year.

Research on CPD at the National Center for Mathematics Education (NCM), Sweden

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In this presentation, a collaboration between three organizations, with very different assignments, is presented: between the Swedish School Inspectorate, the National Center for Mathematics Education and UMERC, a university research center. The study investigates the ways in which teachers offer students opportunities to develop mathematical competencies. Competency goals exist in the curricula of many countries, but how they influence classroom teaching is unclear and not previously investigated in Sweden. Despite the presence of goals of this type in Curricula around the world, there’s a lack of precise research frame works functional as tools for conducting research. Such a research framework is thus developed, presented and used in this study, the Mathematical
Competency Research Framework (MCRF). The study further deals with: how do teachers interpret these goals, and what competency related activities they offer students? Data were gathered through interviews, classroom observations and online surveys with nearly 200 teachers from compulsory schools to the first mathematics course in upper secondary schools. In contrast to most studies of this size, large-scale qualitative analyses were conducted on most of the data. For all studied age groups (school years 3-10), procedural management is the most common competency activity, particularly in working on textbook based tasks. The study finds few indications that teachers interpret the national curriculum in terms of competencies, i.e., regard the curriculum as containing goals for student learning and guides for classroom activities.

Evidence-based continuous professional development

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To establish an evidence-based organization of continuous professional development (CPD) is challenging. In this Round Table, new approaches from Austria, Germany, Sweden and Switzerland are presented. The approaches share that they combine the fostering of CPD activities for mathematics teachers through new types of CPD institutions with research on the effectiveness of different types of CPD. In many countries, national standards for mathematics have been launched by the Ministers of Education during the past 10 years. New demands for mathematics teachers emerged (Blum et al., 2006). Evidence-based continuous professional development that enables the teachers to cope with such a context of change has thus become an important issue in many countries. A systematic research approach is missing in the field of CPD (Lipowsky, 2004; Sowder, 2007). The institutions present in this Round Table aim at closing this research gap.

Evidence on Content-Focused Coaching from Switzerland and the US

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Content-Focused-Coaching (West & Staub, 2003) is a model of professional development that assists teacher learning on the job. Expert teachers work as coaches individually or with groups of classroom teachers to design, implement, and reflect on lessons that promote student learning. Two of the models central elements are an emphasis on collaborative lesson planning in pre-lesson conferences.

**The effect of Dynamic Assessment on student performance in EFL oral proficiency tests**

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This paper explores how Dynamic Assessment (DA) affects students’ achievements of Oral Language Proficiency (OLP) in English-as-a-foreign-language (EFL) within a large-scale test context examining DA mediation used to ‘teach-to-the-test’ for desirable OLP results facilitating learning with assessment. Quantitative and qualitative findings are presented with theoretical and practical implications.

**Using Computerized Dynamic Assessment to Promote EFL Students’ Inferential Reading Skills**

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Dynamic assessment (DA) unifies instruction with assessment to provide learners with mediation to promote their hidden learning potential during assessment. It does not rely on a student’s assessment score as the primary indicator of an individual’s abilities. Previous research used teacher-to-learner mediation in DA to evaluate the students’ progress. However, many Freshman English classes in Taiwan are large in size; therefore, providing human-to-human mediation to each individual learner can be unrealistic. In this research project, Viewlet Quiz 3 software was used to develop a computerized dynamic assessment (C-DA) program that integrated mediation with assessment to support 37 Taiwanese college EFL learners’ inferential reading skills. The research questions are: (1) Is there a significant difference in the participants’ performance before and after the use of the C-DA program? (2) What are the effects of the C-DA program on promoting the participants’ metacognition in their inferential reading skill? and (3) What are the participants’ attitudes toward the C-DA program? To answer the research questions, the participants’ pre and post-test scores were compared, and their written reflections in their working portfolio as well as their responses to a survey were analyzed in-depth. The findings indicated that during the C-DA process, the participants became strategic and reflective readers. Their pre- and post-test scores showed that the participants showed significant improvement in their inferential reading skill after the C-DA program. The survey data also suggested that the participants generally held positive views on the C-DA program.

**The impact of end-of-high-school examinations on schooling**

Michalis Michaelides
Intended and unintended consequences of high-stakes examinations provide evidence for the validation of the assessment system. This study reports teachers’ and students’ views on the impact of an end-of-high-school, university-entrance examination on the school curriculum, teaching practice and schooling experience in Cyprus. Interviews were conducted with twenty teachers who teach courses related to the examinations, and with twenty-five students who had recently participated in the exams. Findings include the increased emphasis given on the tested subjects versus those not tested in the exams, as well as the focus on certain types of skills and practices useful for successful exam performance. Beyond the influence on curricular and instructional practices, test preparation and coaching was highlighted by students as necessary and by teachers as arduous for students and their families. High-stakes assessments impact stakeholders, schools, and the society in general, and although they are circumscribed by local policies and cultural characteristic they inform the international discussion about the consequential validity of tests and the impact on school curricula and instructional practices.

**The effect of high-stakes examination systems on Egyptian Teachers’ Conceptions of Assessment**

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The beliefs teachers have about educational activities tend to be consistent with societal and jurisdictional policy priorities. This paper investigates the impact of high-stakes public examination practices upon teacher beliefs in an Egyptian context. For this purpose, 507 pre-service and in-service teachers completed an assessment conceptions questionnaire. Confirmatory factor analysis tested Egyptian teacher responses against a New Zealand model of four main factors (i.e., Improvement, Irrelevance, School Accountability, and Student Accountability) developed by Brown (2006). The model had good fit to the data (N=507; χ²=655.821; df=313; χ²/df=2.095, p=.15; CFI=.90; gamma hat =.951; RMSEA=.047, 90%CI=.042-.052; SRMR=.0545). The inter-correlation matrix showed strong positive associations among Improvement, School Accountability, and Student Accountability. In addition, the same three factors were strongly inversely related to Irrelevance, indicating the teachers considered these functions relevant. The results clearly show a strong endorsement of student accountability as the primary function of assessment; a result clearly rational for a society driven by diplomas. Further, there was a strong association between Improvement and accountability of schools and students. Within an examination-driven society, it seems entirely logical and rational to link students’ examination scores with the quality of schools and educational improvement. Since the current Egyptian assessment regime operates this way, we should not be surprised that teachers’ beliefs conform. This also suggests that any attempt to reform Egyptian assessment practices is likely to fail, unless efforts focus on using formal tests as the basis of diagnostic analysis of student learning needs.

**Intrapreneurial Skills – Requirements in the Field of Business and Commerce**

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In addition to the so-called 21st Century Skills, rapid changes in social and economic life (‘megatrends’) call for new types of skills, such as intrapreneurship behaviour. Enterprises find this type of behaviour critical in their decisions of choosing job candidates. Vocational and Professional Education and Training need evaluated models of intrapreneurship competence (a) to develop goal-oriented corresponding curricula, (b) to construct instructional methods and (c) to assess the learning output. On this way, it is necessary to get information about intrapreneurial skills, to sort and to value them, here with the help of classification schemes as O*NET-, to bring them into evidence-centered designs as basis for modelling and measuring intrapreneurial competence. The paper demonstrates necessary research steps and first results out of different interrelated empirical approaches.

To Conduct Empirical Research as a Student – Measurement of Research Methodology Competency

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To optimize the quality of instruction, a research- and evidence-based teacher education approach is postulated (Weber & Achtenhagen, 2009; Reusser, 2008). So far, a satisfactory theoretical modeling and measurement of research methodology competency is not realized (Schweizer et al., 2009; Stark & Mandl, 2001). The aim of our study is to operationalize research methodology competency theoretically and to test it empirically. The modeling and measurement process follows the ‘Four-Building-Blocks’-approach of Wilson (2005): The KSA-Model of Binkley et al. (2010), the New Taxonomy of Educational Objectives (Marzano & Kendall, 2008) as well as selected research-methodological content areas and situations (Rost, 2007) constitute the theoretical basis. Tasks with different levels of difficulty according to an ideal research process are correspondingly developed. We decided to use one- and two-dimensional models (understanding-based and evaluation- and construction-based competency dimensions). The analysis is executed using IRT. N=143 Human Resource Education and Management students (LMU, Munich), who attended the course ‘Research Methodology’, make up our sample. The data are collected by an ex-post coding of existing written exams. The analyses are conducted using the PCM, the simple Rasch-Model and the MRCML-Model using the software ConQuest. All items dispose of a high, respectively very high quality and a reliable measurement of the test is given. With regard to the model-fit statistics, the one-dimensional model should be preferred. Concrete recommendations to design further items can be derived from our results and the effectiveness of education in research methodology can be tested.
Cognitive demands and item format as sources of multidimensionality in an ESL reading test

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Standardized reading comprehension (RC) tests developed for educational assessments in first and second language reading frequently combine items with different cognitive demands and different item types. Together, these different types of items are typically treated as unidimensional measures of RC. The paper at hand analyzes the role of cognitive demands and item format of RC test items as sources of multidimensionality of reading test data. For this research a RC test was designed which systematically varied cognitive demands and item format and thus kept both item features uncorrelated. Data from 76 items and 2328 students where used for the analysis. Three structure equation models were fitted to the data: A simple unidimensional model (model 1) with a single factor representing reading comprehension; two two-dimensional models, each adding a second factor i.e. a response format factor (model 2) and a cognitive demands factor (model 3). Both two-dimensional models were within-item multidimensional models, with all items loading on a general factor (RC), and only specific items additionally loading on a second, nested factor. Results indicate that the construction of test scores for RC based on a unidimensional model seems justifiable for the test analyzed for this paper, although some measurable multidimensionality exists. This multidimensionality is rather caused by response format than by cognitive demands.

Development and validation of a computerized item pool as a prerequisite for adaptive testing

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In the field of competence diagnostics adaptive testing is considered as an optimal approach for a highly efficient and economic measurement. As a prerequisite, items have to be part of a calibrated item pool and need to be administered in a computerized testing format. Thus, if one wants to benefit from using a computerized-adaptive testing (CAT) procedure for the assessment of competencies, it has to be resolved empirically whether the computerized item pool contributes properly to a valid and reliable assessment of these competencies. Therefore, in two studies we investigated the development and validation of a (computerized) item pool for a key competency of mathematical problem solving. In study 1 a four-dimensional solution showed the best data fit and proved to be a valid model for the assessment of students’ competencies when working with different representations of functions. However, reliability was still low for diagnostic purposes. Thus, study 2 aims at increasing reliability and validating the computerized item pool for two selected dimensions to implement these items as a computerized-adaptive test (CAT).

The perpetuation of traditionalism in religious schools in French speaking countries-A case Study

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The aim of this research is to identify mechanisms through which parochial schools structure and perpetuate their traditional dimension, and the interests served by preserving traditionalism. The research was conducted among 9 Jewish schools in Paris (6), Brussels (2) and Geneva (1). Findings show that school traditionalism is maintained and constructed systematically through organizational structure, pedagogical and social strategies. The perpetuation of traditionalism in parochial schools of minority groups and its religious justification is an integral part of a power struggle and intended mainly for to ensure control and authority.

A framework for ordering social outcomes of education

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In the last decades the social relevance of education has increasingly been emphasized. Education should endeavour to include not only competences in the academic, cognitive domain but in the social domain as well. A great number of social outcomes of education are being studied. Here, we propose a systematic approach for categorizing social goals that can effectively be realized through education. First, to disentangle the theoretical discussion, prescriptive theories that can be used to
select social outcomes will be divided into two components: a view on the social nature of man and a view on how social relations should be ordered. Liberal-individualism, liberal communitarianism, egalitarian communitarianism and conservative communitarianism are then used to select possible social outcomes of education. Subsequently, a set of functional criteria are offered that can serve as guide in the process of selecting social outcomes through consultation of empirical findings on educational effectiveness. Preliminary empirical findings suggest that attainment of higher levels of education is associated with increased support for liberal outcomes, while it is negatively related to conservative communitarian attitudes.

The Relationship between Judgment Quality and Behaviour Concerning a Socio-scientific Issue

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In Germany, socio-scientific issues are discussed as controversial topics requiring Judgment Competence (JC) (KMK, 2004). As the educational standards for biology (KMK, 2004) postulate, students should be able to judge and make decisions on bioethical and ecological topics after ten years of schooling. An example for a controversial topic requiring reasonable and thorough judgment is the topic of organ donation. We investigate whether the quality of the students’ reasoning and argumentation is related to their decision in favour or against an organ donor card (DC) (behaviour). The exploration of the students’ judgments serves as a validation of the normative construct of JC. In one quantitative and three qualitative studies the students’ JC is assessed and related to their behaviour. The quantitative measures of JC could not predict whether a student signed a DC or not. In the first qualitative study 12th graders are interviewed on their personal decision. The second study assesses 11th graders’ reasons for their individual decisions and in the third study students of 11th grade judge a dilemma-story on a consent decision concerning organ donation. The data was analysed by means of qualitative content-analysis in a group of five raters. The levels of JC in different sub-competences are compared between students with and without a DC. Overall, the students reach low levels of JC. Furthermore, their levels of JC are not related to their behaviour. The process of qualitative analyses revealed difficulties applying the level-specifications to the data material on the topic of organ donation.

An Examination of Student’s Victimization Experiences During K-12 School Years Within the USA

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While peer victimization has been the focus of many recent studies, less focus has been on teacher’s roles in the victimization of students in schools. This study examines self-reported peer victimization and teacher perceived victimization of students (N = 568) in higher education (n = 515), and (n = 53) in middle school using web based data collection methodology. We found high percentages of student victimization occurring in elementary schools, which consisted of a very high percentage of students indicating that they at least occasionally felt intimidated by their teacher. Implications of
these results are that victimization of students by teachers is a problem in schools in the United States.

**Developing and Testing a Learning Progression for Argumentation in Science**

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Learning progressions offer a model for educators of the paths by which learning might proceed within a domain. A particular emphasis of much research, both within science education and other domains, has been on teaching higher order thinking skills and engaging students in evidence-based argumentation. However, no tested and validated model exists of students’ progression with argumentation in science education. We present a model for argumentation based in the work of Toulmin that has been developed and tested over two annual cycles. In each cycle, working with a large sample (n=600) of 14-year-old students, co-development with their teachers of test items and scoring rubrics to improve content validation, and cognitive think-aloud interviews of students has allowed us to monitor response process validity. Item Response Theory and Wright Maps have facilitated comparison of the empirically-determined difficulty of our items with the predictions of our model. To date, this work has confirmed that the lower and intermediate levels of our learning progression are confirmed by the data. This work is important for developing a body of expertise in how to assess argumentation in the context of science and for establishing an empirically-tested model of the nature of student progression with this capability.

**Measuring Primary Teachers’ Science Attitude: The ‘Dimensions of Attitude toward Science’ Instrument**

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This presentation will focus on the stepwise development of a valid and reliable instrument that measures the attitudes of primary teachers toward teaching science, called the ‘Dimensions of Attitude toward Science’ (DAS) instrument. Despite the large number of studies conducted on this topic, thus far a reliable and valid instrument to measure primary teachers’ attitudes toward science was not developed. Existing instruments do not, or incompletely, define the theoretical construct of teachers’ attitude towards (teaching) science or use items that are not constructed nor validated.
according to methodological and statistical standards. The DAS instrument is based on a comprehensive theoretical framework for primary teachers’ attitude toward science. This framework consists of three underlying dimensions (a ‘cognitive’, ‘affective’, and ‘perceived control’ dimension) that each consist of meaningful sub-components of teacher-attitudes. After pilot testing, the DAS was revised and statistically validated using a large group of respondents (N = 556). The theoretical underpinning of the DAS, combined with confirmation from our statistical data, indicate that the DAS possesses good construct validity and that it proves to be a promising research instrument for effect studies of teacher professionalization. In addition, it may be used as an individual teacher training and coaching tool. This instrument can therefore make a valuable contribution to progress within the field of science education, in which teachers’ personal attitudes towards science and teaching science are of fundamental importance.

3rd graders’ understanding of the particle nature of matter before and after teaching

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A curriculum on the particle structure of matter was experimented in a third grade class of 20 children. The curriculum, dealing with the state of matter, physical and chemical changes, comprised class discussions, experiments, drawings, class lessons, the study of short texts, and exercises, and lasted about 23 hours distributed over 15 weeks. On pre-test, following the ‘interview guide’ devised by Liu and Lesniak (2006), children were asked about some substances (water, vinegar, and baking soda), and what happens when any two of them are mixed. In addition, they had to draw these substances and their combinations. On post-test, some questions about molecules and atoms were added to the interview. Whereas on pre-test none of the children mentioned either particles or drew them, on post-test they mentioned molecules 5.5 times (SD = 2.2) on average, and all of them showed particles in their drawings of substances and compounds. However, children did not appear to understand the difference between physical and chemical transformations.

Professional development for adaptive science teaching: content or pedagogical content knowledge?

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With the aim of increasing scientific literacy, learning arrangements are needed, which enable students to learn about scientific ways of working and problem solving. The international research project ‘Innovations for science and technology education in the region of the Lake of Konstanz’ provides 75 teachers in Austria, Germany and Switzerland with a mobile learning arrangement on the
The study seeks to determine to what extent a professional training programme is necessary or beneficial prior to using the mobile learning arrangement in class. Based on concepts of professional knowledge, the effects of professional development are evaluated in a quasi-experimental design with two intervention groups and a control group. Teachers of intervention group I received professional development with the focus on pedagogical content knowledge and teachers of intervention group II on content (physics); no training was given to the control group. Effects of the professional development are examined with pre-tests and post-tests using questionnaire, interview and video-based observation of teaching practice, as well as assessment of students’ learning gains. Results indicate for both groups a slight change on some aspects of teachers’ pedagogical beliefs in the direction of a moderate constructivist concept.

Maximizing the use of human coders and automated techniques to study learning in educational games

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As interest in games for learning has grown, so has the interest in using log data from games to analyze learning processes. Educational data mining and learning analytics techniques have the potential to illuminate learning patterns across large numbers of students; however, these kinds of analyses lack attention to the context within which the games were played. In this paper, we present cross-method validation, a protocol which incorporates the strengths of both learning analytics and qualitative methods to better understand how students learn by playing games. We employed this process while examining elementary students playing an online fraction game and found that while some of our hypotheses drawn from learning analytics were confirmed, many needed revising. This technique is helping us to develop better classification schemes for our larger data sets.

Whole numbers bias in calculations with missing numbers – another chance for conceptual change

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5th and 6th grade students participated in this study, which used the conceptual change theoretical framework to examine another aspect of the whole number bias phenomenon, as it appears in calculations between numbers. The students were asked whether certain calculations between a given number and a missing number could provide specific results. The given results were either in line with students’ intuitions about number calculations (congruent tasks) or not in line (incongruent tasks). The hypothesis of the study was that the students would tend to misinterpret missing numbers as natural numbers and they would anticipate certain results of the calculations, which would be in line with the natural number calculations (i.e., multiplication to always make bigger and division to always make smaller). The findings supported the hypothesis of the study. It appeared that the students did significantly better in the congruent tasks which involved natural numbers as missing numbers i.e., ‘is it possible that $7\times\frac{\text{xa6}}{2}=21$’ than in the congruent tasks which considered rational numbers as missing numbers i.e., ‘is it possible that $\frac{\text{xe2}}{\text{xa6}}+3=4,7$’ Students’ worst performance appeared in the incongruent tasks which involved rational numbers as missing numbers i.e., ‘is it possible that $2\div\frac{\text{xe2}}{\text{xa6}}=5$’ For students to remedy this bias they would need to extend their conceptual fields beyond natural numbers and for doing so they would need to revise their initial framework for numbers which is organized around natural numbers. This entails learning with conceptual change. Further theoretical and educational implications will be discussed.

Are pupils with good maths grades really good in maths – or just better than their classmates?

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Do students with good grades really perform better? More than 40 years ago, Ingenkamp (1971) conducted an experiment which demonstrated that the comparability of grades between school classes is limited. One reason for this result could be that teachers commonly use a social reference standard to assign marks which leads to a grading on a curve-effect. In this study, we compared math grades of 322 pupils (8th grade) from 13 math courses with their performance in a standardised math test. Results show that pupils with better math grades overall scored higher in the standardised math test ($r = .62$, $p = .22$, $p = .47$). Instead, in all but four classes, grades were normally distributed which is very unlikely for such a small sample as a school class. This hints at a grading on a curve-effect. Therefore, more than 40 years after Ingenkamp’s (1971) study, we still have concluded that school grades are more a result of the course pupils are in than of capability and, thus, are earned by chance.

Can Theory of Mind and Personal Epistemology promote Conceptual Change?

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Previous research indicates that common cognitive components underlie children’s ability to think about the mental world (Theory of Mind), their epistemic beliefs about the nature of knowledge and the process of knowing (Personal Epistemology) and their ability to reason about mental models of the physical world (Conceptual change). In the present research we investigated whether an instructional approach that focused on theory of mind and epistemic development would facilitate scientific understanding. Twenty fifth-graders received instruction that focused on understanding in all three domains taking into account the relations between them, while the remaining students received standard textbook-based instruction only for observational astronomy. The results showed positive effects for the experimental group compared to the control. The discussion will focus on the importance of building epistemological sophistication together with content knowledge as a means of promoting conceptual understanding in science.

Towards Franchising in Education? An Empirical Investigation of Chains of Academies in England

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Education reforms in England since 2000 have created Academies, schools that are independent of local authority control. Many academies are run by a single sponsor, thus creating chains of schools. This paper will report on a study of the functioning and effectiveness of these chains, with a focus on the extent of central control and autonomy in these chains. A mixed methods approach is used, with three main elements: - Analysis of existing national quantitative datasets - Analysis of documentary evidence - Telephone interviews with central chain staff Initial analyses suggest that over 50% of academies are part of 21 different chains, which differ in educational and management philosophies and practices, not least in terms of degrees of centralisation. It was found that schools that were part of a chain showed somewhat better performance than those that were not, and the extent of centralisation within the chain was positively related to student outcomes.

Collaboration for school improvement - an empirical study of school networks in the UK

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Governments around the world have invested significant resources to develop collaborative approaches to school improvement. In England, one form of formal collaboration are Federations of schools. This study is one of the first attempts to use a more rigorous quantitative design to explore the impact of this program on student achievement. In order to look at the impact of Federation on performance, we opted for a quasi-experimental design where each Federation school was matched
to a school as similar as possible on key characteristics prior to Federating. Using multilevel models, a positive relationship between Federation and achievement was found, especially where Federations were formed of high and low achieving schools.

**Unraveling the Effects of Critical Thinking Instructions and Practice on Students’ Reasoning**

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Although critical thinking (CT) is considered an important goal in education, it is not clear which instructional techniques are most effective for fostering students’ CT-skills. This study investigated the impact of different CT-instructions on first year economics students’ reasoning skills. Reasoning skills were operationalized as performance on inductive and deductive reasoning tasks. Participants (N = 152) were exposed to one of six conditions: a) CT-instruction text, b) CT-instruction text combined with CT practice, c) CT-instruction text combined with CT practice and self-explanation prompts, d) unrelated text and CT practice, e) unrelated text and CT practice and self-explanation prompts, and f) unrelated text only. Results showed that only participants exposed to CT-instruction (conditions a-b-c) learned. However, learning performance in these conditions was not differentially affected by practice or practice with self-explanation prompts. CT-dispositions (i.e., actively open-minded thinking) correlated positively with pre-test and post-test critical thinking scores, however, the instructions were equally effective for lower and higher scoring participants on actively open-minded thinking.

‘Effectiveness of a portfolio based learning environment’

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‘Effectiveness of a portfolio based learning environment’ Susi Limprecht, Sascha Ziegelbauer & Michaela Gl&xe4;ser-Zikuda University of Jena Institute for Educational Science, Am Planetarium4, 07743 Jena, Germany susi.limprecht@uni-jena.de; sascha.ziegelbauer@uni-jena.de; michaela.glaeser-zikuda@uni-jena.de Abstract How to create learning environments for the promotion of students’ self-regulated and competence based learning is a widely discussed educational issue. A promising approach in this context is the portfolio approach. Therefore, a quasi-experimental intervention study founded by the DFG (German Research Foundation) was carried out
to test the effects of a portfolio based learning environment on students cognitive and affective 
learning aspects in physics classrooms. The main characteristics of the portfolio based learning 
environment such as competence-oriented and adaptive tasks, self-regulation during lessons, 
learning dialogues between learners and teachers, and between learners and learners, and finally 
continuous and multiple ways of self-reflection are presented. The design is characterized by pre-, 
post-, and follow-up measures, and a combination of qualitative and quantitative research methods. 
Significant effects with medium to strong effect sizes of the portfolio intervention regarding the 
enhancement of students’ knowledge, and problem solving competencies, and partly affective 
learning aspects, were measured. Theoretical framework, the concept of the implementation, main 
results, and educational implications for the application of portfolio will be presented and discussed.

There’s more to the multimedia effect than meets the eye: is seeing pictures believing?

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Cognitive Theory of Multimedia Learning (CTML; Mayer, 2005) suggests that adding pictorial 
information to a text is always beneficial for processing this information and building a coherent 
mental model. Other research, however, states that pictures might have a negative effect, because 
they lurk people into believing the accompanying text. To investigate this phenomenon we collected 
eye movements, think-aloud protocols, and performance scores from students solving problems in 
vector calculus with and without graphs. These problems were composed of text and formula as 
given information and a statement about this information that had to be confirmed or rejected. 
Additionally, the multimedia condition received graphs displaying the given information in a pictorial 
manner. Results showed no overall multimedia effect, but instead a significant tendency to confirm 
statements that were accompanied by graphs. Eye tracking analyses showed no specific effect of 
graphs on perceptual processes, hence, we believe that this effect must be due to cognitive 
interpretations of the graphs. Analyses of the verbal protocols should shed light on this manner. The 
results are interpreted and discussed in relation to the CTML and in terms of implications for the 
design of mathematical textbooks.

Instructional support for vicarious learning in medical education

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Simulations with standardized patients can foster knowledge acquisition in medical education. Often only one student can perform such simulations at a time. Offering students to observe the simulation and provide peer-feedback might enhance the effectiveness of the simulation. Scripts were used as instructional approach to support the learners. In a study with 66 medical students we varied an observation script (with vs. without) and a feedback script (with vs. without). We examined the effects on the performance regarding the rectal exam. The observation script specified a list of important features the observer should focus on. The feedback script provided guidelines how to provide helpful feedback. The learning phase was segmented into three phases: First, the student in the examiner role performed the rectal exam while being observed by the observer. Second, while the examiner receives feedback from the standardised patient, the observer prepared feedback for the examiner. Finally, the examiner received feedback from the observer. Results show that the observation script (but not the feedback script) had a positive effect on performance of the observer. Post-hoc comparisons with students without an observation prior the simulation session showed that only students supported by the observation script outperformed learners without the opportunity to observe the rectal exam. This study shows that observation of simulations and giving feedback can enhance performance of learners in a context in which the observer will perform at a later time, but only if supported by an observation script.

**Differential effects of school tracking on the development of non-verbal cognitive abilities**

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All school systems have to deal with different student abilities. Most countries apply some kind of ability grouping. In Germany, students aged 10 or 12 are allocated to different secondary tracks based on their grades in primary school. Previous studies showed that secondary tracks offer different possibilities for subject-specific learning disadvantaging students in lower tracks. This is not only due to different institutional settings, but also due to different compositions of the learning environment. There is also some evidence that tracking affects the development of cognitive abilities. Thus, our research aim is to examine and disentangle the effects of tracking, ability-related and social composition on cognitive development. According to previous research, we expect to find positive effects of the mean cognitive and social school composition. We also assume that the development of cognitive abilities is greater in higher tracks even when controlling for individual and school variables. Institutional and compositional variables are expected to be highly confounded. Data basis is the longitudinal study KESS in Hamburg (Germany) that examines the competences of 9,022 students in 173 schools from grade 5 to 8. Multi-level models examine the effects of individual and aggregated school variables on non-verbal cognitive abilities (KFT with figural analogies; Heller & Perleth, 2000). The analyses indicate that school tracks offer differential learning environments for the development of cognitive abilities with students at academic tracks gaining most. Although
institutional and compositional variables are strongly confounded, they also seem to have specific effects.

**Fostering Information Problem Solving Skills: Effects of Worked Examples and Learner Support**

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Even though students often manage to find their way around the internet in their search for information; information problem solving skills do not develop naturally. Previous research shows that adults and teenagers often encounter problems when solving information problems, indicating that formal training in this domain is needed. This study was an attempt to develop such training. A two-hour computer based instruction was presented to 99 first-year university students at a Belgian university. The effects of worked examples in the form of a video were investigated in combination with different degrees of integrated learner support, namely completion problems and process guidance. Results show that the instruction was effective, but no differences were found between the different forms of learner support: completion problems, guidance, or no support. This indicates that integration of learner support may not always be necessary. Furthermore, students who received no worked example improved much less than students in the other conditions, indicating that worked examples are a powerful and effective tool for skill teaching.

**Measuring students’ strategy-use within a CMS supported course through students’ tool-use patterns**

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The popularity of content management systems (CMSs) in today’s higher education is driven by the assumption that providing a rich toolset and leaving the use of this toolset under learner control will stimulate self-regulated and deeper learning. However, current evidence on students’ tool-use within CMSs indicates that students use the toolset differently and these differences affect their learning. The current study investigates whether students’ tool use in a CMS can be related to students’ strategy use within the course. In this way, the study aims at explaining the tool-use differences and furthermore it strives to find (online) behavioral indications for students’ strategy use. Data were collected within a first years undergraduate course ‘Learning & Instruction’. Students (n = 182)
reported their strategy-use as measured through the Inventory of Learning Styles. Students’ tool-use within the CMS was logged. K-means cluster analyses revealed four clusters that were characterized by different strategies and accompanying tool-use. Specifically, two clusters revealed a tool-use pattern that was in line with students’ reported strategy-use. Interestingly, two clusters revealed a tool-use pattern that was in contrast to the reported strategy-use. These results raise questions with respect to students’ tool-perceptions and students’ calibration capacities.

**Relations among time-on-task, personality and thinking styles**

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Educational Effectiveness Research addresses the question of what works in education and why. This study aims to contribute to the theoretical development of the field, by developing a model concerned with the interaction effects between student-level factors and classroom-level factors. More specifically, this study focuses on the relation of time-on-task, personality traits and thinking styles. The present research paper consists of five sections. In the first section the development of Educational Effectiveness Research is presented from which this study’s theoretical framework has emerged. In the second section a description of the research purpose is provided and the research questions are presented. In the third section, the research methods employed in this study are described in detail, while the contribution to the theory and this study’s significance are discussed in the fourth and fifth section respectively.

**Longitudinal measurement invariance of learning strategy scales: An empirical evaluation**

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Whether learning strategies change during higher education is an important and current research issue in the Student Approaches to Learning (SAL) field. To assess this, data is often collected by self-report measurement instruments and resulting factor scores are compared over several measurement waves. Interpretation of such differences in factor scores assumes that what such instrument actually measures remains constant over time. However, an empirical evaluation as to whether this assumption holds remains scant in SAL research. This study thus innovates in formally testing the assumption of longitudinal measurement invariance of learning strategy scales. The sample consists of one cohort of bachelor students, 245 of which participated in the three measurement waves by filling out the Short Inventory of Learning Strategies (R-ILS), a self-report instrument mapping students’ processing and regulation strategies. To test the measurement invariance hypothesis, a series of increasingly restrictive models is estimated in Mplus, adding
invariance constraints on first the factor loadings and second on the item thresholds. To take into account the ordinal nature of the data, a weighted least squares estimator is used. Results indicate that longitudinal measurement invariance holds for all but two learning strategy scales. For the ‘analysing’ and ‘external regulation’ scales, partial measurement invariance over time was confirmed since respectively two and one thresholds proved unequal across waves. In this light, recent findings on the change in analysing and external regulation during higher education need to be put into question anew.

Is it beneficial for learning to match text modality to learners’ modality preferences?

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By using modern learning technologies it is possible to reflect learners’ individual preferences when designing learning materials by providing many different formats like text, pictures, video or narrations. Hence, preferences for learning with either written or spoken text - so called modality preferences - can be easily taken into account. It seems plausible that learners should learn better when the preferred modality is provided but there is still no empirical evidence for this assumption. In our study we analyzed whether learning outcomes and perceived cognitive load are optimized when learners are enabled to learn in their preferred text modality. We conducted an experiment (n=43) with a 2x2 factorial design with the factors modality preferences (visual or auditive) and presented text modality (visual or auditive) and the dependent variables recall and comprehension as well as perceived cognitive load. In fact we found a significant interaction between preferences and presented modality for comprehension and by trend for cognitive load: while learners with a visual modality preference suffered significantly when provided with the ‘wrong’ material, auditive preference learners were only slightly affected. Obviously it is worth taking preferences into account in order to optimize multimedia learning materials.

The effects of metacognitive instruction on students’ judgment of learning and delayed achievement

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Although many studies have examined Judgment of Learning (JOL) and its accuracy under different conditions, most of these studies have been carried out in labs, and the dependent variable has been memory and recall. Generally, the main conclusion of these studies is ‘easy learned-easy remembered’, namely the less trails students make, the more items they recall. There is a lack of studies on how students judge their learning in the classrooms, under different instructional
methods, where they had to study sophisticated materials and be examined on their learning. The present study addresses this issue. In particular, the purpose of the present study is threefold: (a) examining students’ JOL under two conditions: being or not being exposed to metacognitive instruction; (b) exploring the accuracy of students’ JOL under each condition; and (c) comparing the immediate and delayed effects of both methods on students’ achievement in geometry. The study used quantitative and qualitative methodologies. Participants were 90 ninth graders: 48 students who studied geometry via IMPROVE (e.g., the metacognitive instructional method) and the rest (N=42) served as a control group. Measurements include mathematics exams (pre- and post-tests), JOL questionnaire, and classroom observations. Results indicated that the IMPROVE students significantly outperformed the control group on JOL as well as on the immediate and delayed posttests. The theoretical and practical implications will be discussed in the conference.

Self-regulated learning with expository texts – an explorative analysis of its structure

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The study analyzes the structure of self-regulation competence when learning with expository texts. Theoretical background of the study is the model of self-regulation competence by Schuette, Wirth and Leutner (2010), who identified ten competencies which are necessary for a successful self-regulation. Based on this model, Schuette (2012) analyzed the structure of self-regulation competence revealing a two-factor solution of internal and external prerequisites for learning. However, a few competencies failed to load on either of the two factors and didn’t constitute one common factor. Against this background the structure of self-regulation competence was reanalyzed using a modified operationalization for these competencies. Using an explorative factor analysis (principal component analysis with varimax-rotation), three factors could be identified representing the competency to judge one’s own knowledge base (factor 1), the competency to judge given learning conditions (factor 2) and the competency dealing with learning strategies in general (factor 3). This includes the competency to activate one’s own strategy knowledge as well as competencies to apply specific learning strategies. Those three factors support the three-factor-model by Flavell (1979), who identified the factors person, task and strategy as prerequisites for learning. Based on these findings, we discuss the results with respect to the theoretical and practical use for further research.

Production vs availability deficiency of metacognition: comparing low and high achieving students

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Metacognitive skills can be defined as the self-regulation of cognitive processes necessary for learning. However, some students may suffer from a lack of metacognitive skills (availability deficiency), or from deficiencies in the production of metacognitive skills when appropriate. The objective of this study was to examine whether students from higher general secondary education
suffer more often from a production deficiency, whereas prevocational students suffer more often from an availability deficiency in metacognitive skills in the domains of mathematics and logical reasoning. Also, the roles of IQ, achievement motivation, and fear of failure were examined in relation to metacognitive skills. Students solved six mathematical word problems, three without metacognitive hints and three with hints. Similarly, students solved six logical reasoning problems with the game Master Mind, of which three games were played without hints and three with hints. Metacognitive skillfulness was assessed by rating thinking-aloud protocols for both tasks, and by computerized scoring of logfile data (Master Mind). Results showed that both school-level groups of students profited from receiving metacognitive hints in the domain of mathematics. In the domain of Master Mind, however, both groups showed no improvements due to metacognitive hints. On the latter task, though, students low on achievement motivation decreased their metacognition and performance levels after being presented with metacognitive hints, whereas students high on achievement motivation did not. A working memory overload is suggested as explanation for the findings in Master Mind.

Investigating the development of self-regulated learning in the online environment

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The aim of this dissertation research project is to investigate how higher education students develop and refine self-regulatory strategies and behaviours in the e-learning context over time. In this longitudinal study, students are performing self-selected tasks within an online course forum in a laboratory setting with their eye movements tracked using Tobii X120 technology. At the end of the task, participants are then shown video of their eye movements during task performance and asked to describe their experience of the task in retrospect. Through the triangulation of eye tracking metrics, direct observation and participant self-report, participants’ cognitive and self regulatory behaviours are being explored in regards to self regulated learning strategies such as planning, monitoring and decision making. This paper will report on the results of the initial findings of this study and offer insight into how eye tracking metrics along with self report data can be considered in exploring student self regulatory behaviour and acquisition of lifelong learning strategies.

Measuring Teacher Engagement: Development of the Engaged Teachers Scale (ETS)

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Teachers who are engaged in their work are more likely to influence students to be engaged in their learning (e.g., Pianta, Hamre, & Allen, 2012). Although work engagement research in business settings is thriving (Sonnentag, 2011), it has not received the same level of attention in education settings, at least partly due to a lack of suitable measurement tools. The teaching profession is unique among professions in its emphasis on building strong relationships with the 'clients' of the work, and current measures of work engagement do not reflect the specific conditions of the classroom. The goal of this study was to create and validate a brief multi-dimension scale of teacher engagement—the Engaged Teachers Scale (ETS)—that reflects the particular characteristics of the work of teaching in schools. We collected data from four samples of teachers (N = 823), and followed five steps in developing and validating the ETS. The result of our five steps of analysis was a 16-item, 4-factor scale of teacher engagement that showed evidence of reliability, validity, and usability for future research.

The 3x2 Achievement Goal Model for Learning Exam-Relevant Material: Links With Emotions

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The aims of this work were (a) to investigate the psychometric properties of a first Italian version of a questionnaire measuring achievement goals as conceptualized by the 3 X 2 model (Elliott, Murayama, & Pekrun, 2011) and (b) to study the relationships between these goals and achievement emotions among university students. The participants were 350 Italian university students who completed a 48-item questionnaire measuring both goals and emotions in a setting characterized by learning exam-relevant material. Achievement goals referred to 6 goal constructs (task-approach, task-avoidance, self-approach, self-avoidance, other-approach, and other-avoidance goals), while achievement emotions related to ten discrete emotions (enjoyment, pride, hope, relief, relaxation, anxiety, anger, shame, boredom, hopelessness). A confirmatory factor analysis showed the goodness of the 3 X 2 model, proving the existence of six factors relating to the six hypothesized goals. Correlations between these six factors and some achievement emotions could help to better understand the role of achievement goals. Enjoyment, pride, hope, relief, and relaxation correlated positively with task-approach and self-approach goals, while anger, shame, boredom, and hopelessness correlated positively with other-approach goals and negatively with task-approach and task-avoidance goals. Given the pervasiveness of both achievement goals and emotions in students’ daily life, our results could help to devise intervention programmes focusing on antecedents of achievement emotions, contributing to ameliorate not only students’ academic performance but also their subjective wellbeing.

Empirical exploration of a unified model of task-specific motivation

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This paper explores the tenability of a unified model of task-specific motivation (UMTM). This model is an attempt to conciliate the controversies of current motivation theories. Core assumption of the model is independence of ‘hot’ aspects and ‘cold’ aspects of motivation, here labeled as affective valences and cognitive valences. A sample of 345 teachers from primary and secondary education provided responses on all components of the model (affective and cognitive valences and influential conditional factors) with respect to three types of professional learning activities (formal learning courses, gathering information from the literature and other sources, and reflection with colleagues on current practices). Confirmatory factor analysis of the measurement model revealed that the three types of activities were so different that each activity required a separate path model. The three models we developed, however, appeared to be specialized variants of a general model that by and large supported the relations in the theoretical model. One important exception was that feelings of relatedness did not directly influence affective or cognitive valences. The data required also some additional paths. Furthermore, the type of activity determined to what extent some components of the model come into play, like for instance the adherence to social norms about the intended activity. Also it appeared that several components, like feelings of autonomy and feelings of competence, can contribute directly to the performance of the intended activity. All in all, this preliminary exploration of the UMTM represents a first promising step to reunite existing theories of motivation.

**Reading motivation of 10-14 year-old students: A domain-specific learning motivation approach**

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This paper reports the results of a study aiming at the testing of a model of reading motivation along with an instrument that measures motivation within the domain of reading at ages 10 to 14. Subscales of the instrument explore eight motivational constructs established by different theories on learning motivation within the domain of reading: (1) attitudes towards reading; (2) social motives of reading; (3) self-efficacy in reading; (4) the causal attributions of reading successes and failures; (5) flow in reading; (6) value attributed to reading; (7) reading self-concept; (8) goal-orientations in reading. Participants were 755 Hungarian primary school students from grade 4 (ages 10-11; n=218); grade 6 (ages 12-13; n=278) and grade 8 (ages 14-15; n=259). Results provided evidence for the appropriateness of the model and revealed an interwoven set of motivational constructs related to the reading activity in different contexts. On the basis of the results of the reliability testing and the factor analysis, the newly developed instrument also proved to be appropriate measure of motivation in the domain of reading at ages 10 to 14. Data also suggests that motivation for reading declines with age, which calls attention to the need for the targeted development of the individual reading motives.

‘I just needed some sleep”: Students’ self-reported reasons for playing truant

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Student self-reports were used to identify major reasons for playing truant. We hypothesized that there are different patterns of reasons why adolescents play truant and that truancy rates differ by these reasons. Our representative sample consisted of 3520 grade 10 students in 82 German schools who were almost 16 years old. First, we conducted an exploratory factor analysis with truancy reasons to find patterns in them. Second, we grouped students according to their reasons and compared truancy rates. Two patterns of reasons emerged: truancy due to pressure (group 1) and truancy as avoidance behavior (group 2). Students in group 1 skipped significantly more classes than students in group 2. We conclude that reasons for playing truant affect students’ truancy behavior.

Does attending a low school track affect psychosocial development?

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The transition from primary to secondary school can be accompanied by the development of psychosocial problems among students (such as aggressive behavior or low self-worth). Until now, it remains rather unclear how academic tracking affects this process. Given that tracking might have a specific negative impact on students in the lower school types, it was examined whether attending a low track poses a heightened risk for critical psychosocial development. This was tested as part of the longitudinal ‘Fribourg Study on Peer Influence in Schools’ (FRI-PEERS). The 730 students considered here attended their first year in secondary school (7th grade) in one of the regular academic tracks (high, middle, or low) or special needs classes for students with learning difficulties. Participants were assessed with the Reynolds Adolescent Adjustment Screening Inventory at the start and the end of 7th grade. Controlling for psychosocial problems at the beginning of the school year, multilevel analyses indicated that students from the low track developed more problems over time than pupils from other tracks. This result remained relatively stable when additionally controlling for the students’ background characteristics. The possible mechanisms underlying this finding will be discussed.

At-risk students’ perception of factors related to high school completion

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The study investigates the school related factors that influence high school completion by students with special needs in Quebec (Canada). It aims to document the factors and also the suggestions provided by students to improve the school experience of future students. Finally, it compares the
perception of students with or without diplomas about their school experiences. One-hour semi-structured interviews are performed with students having a diploma or not. Among other things, findings show that youth without diplomas make more external attributions to explain success or failure such as teachers’ attitudes and pedagogical techniques whereas youths with diplomas assigned success to engagement and will. This study enlightens our understanding of the obstacles encountered by students with special needs.

Factors that influence high school completion for students with special needs

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Mainstreaming is a priority in the Quebec school system. However, very few studies have documented the situation of students with special needs in this setting. Therefore, this study aims to determine school related factors that influence their high school completion. To do so, statistical analyses are performed on data collected from 9,862 students from one Quebec geographic area. The results show that school inclusion and professional training are key elements in these students’ academic success. This study targets firstly factors that could improve the chances of students with special needs getting a high school diploma and, secondly, strategies to improve their overall academic success.

Professionalization of Urban Teachers

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This study examined the contribution of a professional development programme aimed at equipping teachers for the challenges of teaching in urban primary schools. The contribution of the programme to the quality and retention of teachers was evaluated by a mixed research design; both quantitative and qualitative approaches were used to answer the research questions. In total 133 teachers participated in this study; 66 teachers participated in the programme (the experimental group) while the other 67 teachers served as a control group. Results showed a significant effect of the programme on teachers’ knowledge of issues relevant for teaching in urban primary schools and their sense of self-efficacy. Furthermore, the teachers highly appreciated the programme and perceived a positive impact of the programme on their competences, self-efficacy and professional
orientation. The teacher network in which experiences could be shared was considered the most valuable element of the programme by the teachers.

An Approach to Overcome the Barrier of Teachers’ Prior Pedagogical Knowledge in Pieces

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Knowledge in pieces—coherent, unsystematic (prior) knowledge which often differs from normative knowledge—may limit the effectiveness of training interventions. Providing a generalized, categorial scheme as a structuring framework could help learners with such knowledge in pieces learn more from such interventions. The findings of Slotta and Chi (2006) in physics learning support this hypothesis. A pre-training intervention that provided two abstract categories to which learners often spontaneously assign physical phenomena incorrectly increased learning outcomes about electricity. In our study, 45 student teachers worked on a computer-based tutorial on the assessment of learning strategies. However, before using this tutorial, the framework-group (n = 23) received a generalized, categorial scheme providing them with an idea of how to distinguish learning strategies. This scheme could be used as a structured framework for knowledge organization. In contrast to the framework-group, the control group received a comparable pre-training intervention providing only scattered, factual information about categories of learning strategies (i.e., no structured framework). We found that both groups achieved about equal learning outcome (descriptively better outcomes for the framework group). However, the categorial pre-training intervention reduced the learning time in the tutorial significantly. Hence, the pre-training intervention led to more efficient learning. We presume that an improved intervention could yield increased effects. Overall, the study indicates which method can be used to help overcome the barrier of ‘incompatible prior knowledge in piece’ and, thus, to optimize training intervention effects.

The core of religious education – Finnish student teachers’ pedagogical aims

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This paper investigates the core of religious education through Finnish student teachers’ pedagogical aims. Pedagogical purposiveness is the core of the teachers’ pedagogical thinking (Kansanen, Tirri, Meri, Krokfors, Husu & Jyrhämä, 2000). Teachers’ purposiveness is implemented in interaction in the classroom, which depends on the teacher, the students and the content (a didactic triangle), and the interrelations between them (Herbart, 1835). In this paper, we investigate Finnish student teachers’ views on the core of religious education through their pedagogical aims and how interrelations between the teacher, the students and the content are part of Finnish student teachers’ pedagogical aims and purposiveness in the context of religious education. The data included essays (N=80) written by Finnish student teachers of religious education. The results show that student teachers of religious education acknowledged the normative nature and context-dependence of their teaching. Their main goal was to promote the didactical relationship between their students and their subject, religious education. We conclude that the student teachers of religious education demonstrate pedagogical thinking in their essays that is a prerequisite to purposeful teaching.

Do Self-Regulation Competencies Predict Teacher Well-Being?

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In order to reduce turnover, one needs to improve teacher well-being. Consequently, it’s important to understand the processes that underlie teacher well-being. Self-regulation has been shown to be related with two aspects of teacher well-being (job satisfaction and emotional exhaustion) and therefore might explain individual differences in teacher well-being. By means of structure equation modeling, this research aims at testing whether high levels of self-regulation can predict high levels of job satisfaction and low levels of emotional exhaustion. The sample consisted of 664 mathematics teachers from 99 schools in Germany teaching grade 5 and higher. Data collection was embedded in the 2011 field trial for the 2012 cycle of the OECD’s Programme for International Student Assessment (PISA). The overall model fit was acceptable. All tested relationships were statistically significant and unaffected by gender, teaching experience and school type. The research findings provide a first hypothesis-confirming insight into the order of the relationship between teacher self-regulation and teacher well-being. However, longitudinal research is needed to draw final conclusions about the predicting role of self-regulation in teacher well-being.

Multifaceted Observation Systems: Examining the Quantity and Quality of Instructional Interactions

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This paper describes a comprehensive observation system designed to document the quantity and quality of instructional interactions and the relation between these interactions and student academic performance in reading and mathematics, across elementary and secondary school settings. Data from three rigorous studies conducted in several geographic regions of the United States are shared. Nearly 500 classrooms, observed in the fall, winter, and spring of each school year, and 6,500 students participated in the studies. Results of the three studies provide evidence for the reliability and validity of the observation system to document the quantity and quality of instructional interactions and predict student achievement in reading and mathematics. Results also provide preliminary evidence for the utility of a multifaceted observation system to advance the science of intervention research.

How content becomes routine. Teacher learning in desk interactions

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In this paper we focus on classroom interaction between teacher and students in desk interactions, and on how attitudes towards knowing and learning are demonstrated in so called epistemic stances. The aim is to explore how the teacher’s epistemic stance changes through a series of desk interactions with different students and how this can be understood as learning in a situated activity. The analysis is grounded in empirical data consisting of video recordings where one teacher assists five different groups of students with the same question during a geography lesson. In the analysis
we highlight how the teacher orients to the learning activity, and how his participation in this activity changes in the situationally unfolding contingency of interaction. In the studied example, the construal of a list with three examples becomes an interacational resource for the organization of both participation and content. Through changes in epistemic stance, a learning trajectory evolves as the teacher tries out a routine. These subsequent changes can be understood as professional learning in on-going teaching. In the studied classroom, the main feature of this learning can be described as routinization.

**Occurrence and importance of cognitive activation in fourth grade reading classes**

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Against the background of needs to improve reading competence of pupils and to broaden the empirical base of reading instruction at school, the presented study investigated the occurrence of features of reading instruction, in particular of different forms of cognitive activating measures, and their importance to reading achievements of fourth graders. Therefore in fourth grade classes (N=42) data on features of pupils and reading instruction were collected by means of reading competence tests, teacher questionnaires and video-based classroom observations. The analyses showed that cognitive activating reading instruction, and in particular text reflection, has been observable in many classrooms to a high amount of time. Furthermore multilevel analyses revealed the amount of cognitive activating reading instruction as a significant predictor to account for the reading competences of pupils. While this effect was neither mediated by the attention of pupils during lessons, nor moderated by their pre-knowledge or social background, it was moderated by the individual language background: Pupils with a foreign language background benefitted less. In particular, the finding on the direct effect corresponds with results from other analyses and recommendations in literature. Hence the results of the study strengthen assumptions on the importance of cognitive activating reading instruction, which has to be examined under experimental conditions to finally supply an empirical foundation for future instructional practice.

**Improvisation: an authentic practice for an enhancing learning**

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The paper’s purpose is to present improvisation as an authentic practice that involves higher order skills and deep understanding (improvisation as a privileged form of ‘complex thinking’) and as an amazing form of continuous learning always contextualized and socialized. Every improvisation is developed as a performing process that involves completely the person (his mind, body, history), putting him in a state of calm alertness: improviser is always sensible and responsive to what happens around him, ready to interiorize new stimuli and to face the new challenges in a comfortable way. Ten semi-structured interviews were made to professional improvisers, to identify some common dimensions and features of improvisational process. The data analysis is being conducted with a bottom-up process inspired by Grounded Theory. An interesting result is the link between improvisation and learning, that makes emerge improvisation as a never-ending learning process in which discoveries are made and internalized thank to the practice itself. The map of improvisation’s dimensions will be presented and the focus will be on the learning process involved
in improvising. It will try to answer to the question suggested by Moorman and Miner (1998), whether improvisation produces learning: the answer will be that improvisation not only produces learning but it is a practice that can be proposed also at school for an authentic, sustainable, and enhancing learning.

**A Divergence Between Assigned and Reported Learning Strategy Use**

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To support teachers in creating robust learning environments for students, Chi (2009) proposed an educational framework designed to help educators encourage beneficial active and constructive studying. In the present study, students who were randomly assigned to use active and constructive learning strategies did not outperform passive learners. However, self-reports of what participants did while studying did predict learning outcomes that were consistent with the framework. The declared major of students impacted chosen learning strategies. Those with a background related to the learning material tended to engage in more active and constructive strategies despite, in some cases, being assigned to study passively. These variables and their relationships to the study material are discussed in regards to students’ proclivity to engage in beneficial studying.

**Comparative analysis of arithmetic word problems in elementary mathematics textbooks**

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Researchers have identified the tendency of students to think superficially and abstain from sense-making when confronted with arithmetic word problems (Verschaffel, Greer, & De Corte, 2000). Research has found that the nature of word problems used in mathematics classrooms is important for developing students’ realistic reasoning. Exposure to situationally rich problems (which resemble authentic quantitative problems people may encounter in real life) is considered essential for triggering students’ sense-making in problem solving. Our analysis focused on the new 5th-grade elementary mathematics textbook published by the Pedagogic Institute of Greece following a major mathematics educational reform that took place in 2003, meant to promote inter alia critical reasoning in problem solving (Pedagogic Institute, 2003). In particular, we examined whether the word problems in the new textbook are close to authentic out-of-school quantitative problems and how they compare with the ones contained in the old textbook. For our analysis we used a classification framework (Palm & Burman, 2004; Depaepe, De Corte, & Verschaffel, 2009) developed to measure the degree of simulation at which a number of aspects of reality are represented in word
problems. Our comparative analysis showed some changes in the representation of different aspects, as well as persistent shortcomings.

**Concept Mapping, is it the Mapping or the Wrapping?**

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Students have to organize what they learn in such a way that new concepts are connected with what is already known. Concept mapping can be used to let students organize new and old concepts in a visual way. We report on two studies looking at the effects of concept mapping in different settings. The first study shows the positive effect when comparing a group using concept mapping with a control group having extra time to work on examples, in the context of physics education. However, what is the essential ingredient in this method? Is it the visual mapping or is organizing a wrap-up activity as such important? The second study shows that written summaries can have the same effect when compared with concept mapping suggesting that it is ‘the wrapping’ that does the trick.

**Expert Blind Spot in Pre-Service and In-Service Teachers: Effects of Task Design and Expertise**

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To act efficiently in the classroom, teachers should judge the difficulty of problems from a novice’s perspective. However, research suggests that experts use their own knowledge as anchor, thus underestimating the difficulty a problem may impose on novices. Similarly, experts should underestimate the benefit for novices of task designs derived from Cognitive Load Theory, as, following expertise reversal effect, these should be rather disadvantageous for experts. We investigated pre-service and in-service teachers’ competencies in estimating the difficulty of mathematical tasks for novices. Thirty-four pre-service teachers and thirteen in-service teachers solved tasks that varied in instructional design (optimized for novices following CLT versus non-optimized). They estimated how difficult each task would be for novices. Solution frequencies were collected from fifty-two 9th grade students. In both expert groups, overestimation was clearly more pronounced for non-optimized than optimized tasks, suggesting an expert blind spot that can be explained in terms of an expertise-reversal effect. However, whereas pre-service teachers’ overestimations of student performance were large and significant both for non-optimized and
optimized tasks, in-service teachers’ overestimations were generally small and failed to approach statistical significance. This result may suggest that in-service teachers were less subject to an expert blind spot. However, given that in-service teachers performed significantly worse on the mathematical tasks as compared to pre-service teachers, we concluded that the non-significant overestimation effect rather should be attributed to a lower level of mathematical expertise than to in-service teachers’ superior perspective taking.

**Teacher-child instructional interactions in kindergarten read-alouds and children’s language gains**

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Instructional interactions in early-education classrooms are crucial in the prediction of children’s developmental outcomes. We explore the characteristics of teacher-children instructional interactions during read-aloud sessions in Chilean kindergarten classrooms pertaining to a large-scale randomized early-education intervention. Taking a micro-analytic approach we analyze the function and level of complexity (literal vs. inferential language) of each interactional turn during these sessions, in order to detect significant interactional patterns. We are particularly interested in examining the quality of Initiation/Response/Follow-up (IRF) cycles. Preliminary results of nine control classrooms show that teachers strongly determine the level of complexity of children’s turns. We identified distinctive patterns of interaction in classrooms that focused the session on text comprehension (n=7). Most of these patterns followed an IRF sequence, but at different levels of cognitive challenge. The most prevalent patterns contained simple forms of follow-up instead of elaborative ones. Moreover, sessions differ greatly in terms of the amount and/or level of complexity of their patterns. Given the limited amount of classrooms at the moment, we visually explored the association between the total number of patterns per session and average children’s gains in four language tests. We observe a positive trend between the number of Literal patterns and gains in Vocabulary and Text Comprehension tests, while a positive association between Inferential patterns and Letter-Word Identification gain scores is suggested. The inclusion of intervention classrooms (n=17, already coded) will allow for a clearer representation and actual testing of the relationships between the interactional patterns and the outcome variables.

**A negative effect of projected slides on learning in lectures with and without note-taking**

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Prior research has revealed a negative effect of projected slides on the recall of information that is presented only orally. The present study aimed to replicate this so-called speech suppression effect...
in a different topic domain, and tested whether this effect also occurs in learning situations in which learners are allowed to take notes. In a two-factorial design, a video-taped lecture about the German legal system was shown as a life-size projection with or without PowerPoint text slides projected onto a screen in the video to learners who were allowed or not allowed to take notes. Recall was measured separately for information that was presented only orally and information that was presented on slides (in the conditions with projected slides) by means of a multiple choice test. The participants were 41 students from a degree program in education. The slide projection had a significant negative effect on the recall of information presented only orally both in the conditions without note-taking and in the conditions with note-taking. The effect of note-taking and the interaction were not significant, and no effects on the recall of information presented on slides were detected. The study therefore replicated the speech suppression effect for a new content domain and for a learning situation in which learners were allowed to take notes. Future research should strive to clarify the mechanisms underlying the speech suppression effect.

**Language competences and teaching strategies**

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In order to prevent the grammar mistakes in language acquisition, appropriate teaching practices should be used in teaching process. The scope of this paper was the analysis of language teaching strategies, including students’ typical grammar mistakes, teachers’ correction practices and their beliefs of effective strategies in prevention of mistakes. Twenty-two Estonian teachers and their students from grade 7 (N = 389) participated in the study. First, the students’ competences in spelling, syntax and determination of the sentences’ purpose of communication were tested. Then, the teachers’ activities to correct students’ grammar mistakes were questioned. According to practices described by teachers they were divided into six groups (e.g., developing students’ higher-order thinking skills; enhancing mainly students’ retention skills etc.). Third, employing person-oriented approach, relations between students’ grammar competences and their teachers’ teaching profiles were found. Low results of spelling task were more typical to students whose teachers employed mainly retention practices. In determining the sentences’ purpose of communication high results were typically achieved by students whose teachers combined implementation practices with analyzing and reasoning. In syntax task fewer students than expected by chance obtained low results in group of teachers who mixed reasoning and analyzing practices with retention. Finally, teachers’ beliefs of effective strategies in prevention of grammar mistakes were asked and associations between teachers’ beliefs and practices were analyzed. The teachers described their correction practices in accordance to their beliefs of the effectiveness and appropriateness in prevention of students’ grammar mistakes.

**Does PowerPoint foster learning? A meta-analysis**

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A series of studies about the effects of computer-based slides in lectures on learning as compared to either no slides or overhead slides has produced largely insignificant findings. Because smaller studies may fail to demonstrate a significant effect despite its existence, the present meta-analysis
was conducted to estimate the mean effect of computer-based slides on knowledge acquisition, and to investigate whether there is a difference between the mean effect of computer-based slides compared to no slides and the mean effect of computer-based slides compared to overhead slides. Thirty-nine independent effect sizes from 27 publications reporting studies that used objective measures of knowledge acquisition were integrated by means of a random effects analysis. The results indicated a significant but low mean effect ($d = 0.11$) as well as significant heterogeneity of the individual study effects. Furthermore, the effects resulting from comparisons to no slides and from comparisons to overhead slides did not differ significantly from each other, and the heterogeneity within these two groups of studies was still substantial. It is concluded that there is a negligible effect of using computer-based slides in teaching on knowledge acquisition. Further, the findings are in line with the view that it is not the media themselves that impact learning. Rather, differences in learning outcomes may result from different instructional design of the slides used. Therefore, future studies should focus on specific design features and investigate their impact on learning outcomes.

**Are pictures helpful for learning because they facilitate imagery?**

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The aim of the reported study was to test an alternative explanation for the multimedia effect, that is, the superiority of text-picture combinations compared to text alone. It was assumed that learning with text alone requires learners to actively generate mental images of the described content. Presenting a picture, on the other hand, might reduce this need to actively construct mental images because learners can heavily rely on the pictorial stimulus. Thus, pictures might facilitate imagery thereby freeing up cognitive resources in visuo-spatial working memory, which can then be used for other cognitive processes associated with learning. This hypothesis was tested in an experiment based on a $2 \times 2$ design with picture presentation prior to text (yes vs. no) and visuo-spatial secondary task (with vs. without) as independent variables. Participants learned about the development of tornados and had to answer recall and transfer questions afterwards. The results confirm the hypothesis that pictures can facilitate imagery: Those learners who did not receive any pictures showed an interference with the visuo-spatial secondary task performed during text processing. This indicates that their visuo-spatial working memory was loaded during text processing, presumably because they generated mental images during reading. On the other hand, learners who received pictures prior to reading the texts did not show such interference indicating that their visuo-spatial working memory was not loaded to a high degree. This interpretation is supported by the finding that pictures were especially helpful for learners with low imagery capacity. The implications of these results are discussed.

**Including Principles in Instructions for Procedural Tasks: Timing of Use and Method of Study**

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Including domain rules and generalities (principles) in instructions for procedural tasks is believed to help learners understand the system or task domain and make them better able to complete new tasks. However, equivocal results of prior research indicate that principles are not always beneficial. The goal of the current research was to understand whether the timing of principle use (before, during, or after completing training tasks) and study method (summarizing or reading) determine the conditions under which principles are helpful for learning. Participants (N = 96) completed three training tasks learning to troubleshoot a simulated electrical circuit and were then tested immediately after training and again one week later. Training task performance was better for participants who summarized the principles before completing the training tasks, but reading them or using them during task completion was no better than not having them at all. The study method did affect learning: Summarizing the principles led to better declarative (knowledge of the system) and procedural (troubleshooting task performance) learning compared to just reading the principles. The timing of principle use did not affect declarative or procedural learning. Therefore, the commonly advocated idea that principles should be provided before task engagement was not supported. Neither was the hypothesis that using principles while solving tasks would enhance learning. The results reveal how the learning situation and instructional materials can be constructed to create conditions where principles enhance learning.

Learning with multimedia: Evidence for text-picture integration

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According to theories of multimedia learning (Mayer, 2009; Schnotz, 2005) pictures aid learning because information from texts and pictures is integrated into one single representation. We investigated this integration assumption by using a modified paradigm introduced by Gentner and Loftus (1979). Learners memorized series of pictures and sentences that resulted from cross-varying type of picture (general vs. specific) and type of sentence (general vs. specific) within subjects. It was assumed that if text-picture integration takes place, learners should be less able to trace back the learned information to a specific representation. This should result in lower performance in a later recognition test. We already developed and tested stimulus materials in three pre-studies (Arndt, Schueler & Scheiter, 2012). The results supported our assumption of text-picture integration, but they differed slightly between experiments. The aim of the study reported below was to test text-picture integration with the final item pool and to replicate the findings with a shorter interval between learning phase and post-test. As in the pre-studies, we expected lower recognition performance when sentences and pictures differed with respect to their specificity. The results corroborate the assumption of text-picture integration for the recognition of sentences. Specific picture information was integrated with general sentence information, leading to a lower recognition performance in the post-test. In the next step, an eye tracking study will be conducted to have a closer look at the cognitive processes of text-picture integration.

How a Picture Fosters Comprehension of Text: Evidence from Eye Movements on Blank Screen
The goal of the present experiment was to study on a more fine-grained level how processing a picture may influence the process of learning from text. It was hypothesized that a picture supports learning from text not only when inspected for self-paced but also when inspected for a short time only. This was hypothesized, because a picture was assumed to rapidly convey global spatial information that can be used as a mental scaffold to support mental model construction and thus comprehension of text (scaffolding hypothesis). To test the scaffolding hypothesis, students (N=84) learned about the structure and functions of pulley systems from text or from text with previous presentation of a picture for 600ms, 2sec, or self-paced. Students’ eye movements on blank screen while listening to text as well as their comprehension scores for the pulley system’s functions were analyzed. Results revealed that in conditions with initial picture inspection (for 600ms, 2sec, and self-paced) more eye movements in line with the picture’s global spatial orientation were made while listening to text and looking at a blank screen. Moreover, comprehension of the pulley system’s functions was better in conditions with initial picture inspection (for 600ms, 2sec, and self-paced) than in the text-only condition. Results suggest that global spatial information extracted from brief and self-paced picture inspection was used for mental model construction from text leading to better comprehension, and thus yielding support for the scaffolding hypothesis.

**Effective CPD: a necessary component of responsible teaching and sustainable learning**

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Continuing professional development is currently high on the Scottish Education agenda. Recent curriculum reform in Scotland, with the introduction of Curriculum for Excellence, places Physical Education (PE) at the forefront for its role in directly supporting learners’ mental, emotional, social, and physical wellbeing. This emphasis on PE, along with concerns about the health of the nation, has resulted in a nationwide initiative providing non-specialist teachers of primary PE with the opportunity to develop a specialism in the subject through government-funded continuing professional development (CPD) programmes at postgraduate level. Using Knowles’ ‘andragogical model’ as a framework, this paper investigates the motivations, perceptions, and experiences of the teachers who took part in the programme delivered by one Scottish university. Using mixed-methods research, teachers’ views of the effectiveness of the programme will be linked to their own competence, confidence and ability to teach PE. Moreover, a scrutiny of the impact of the programme leads to a reflection on the dimensions that comprise effective CPD, as these are key factors leading to capacity building and responsible teaching among teachers as well as effective and sustainable learning towards a transformational change for the pupils’ primary PE learning.
A study of the effects of curricular innovations on student professionalization in higher education

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Today’s universities face challenging demands and expectations towards better preparing students for the workplace in a fast-changing society. As a consequence, curricular innovations are increasingly taking place in programs concerned with preparing students for effective professional practice. However, effects of such programs are rarely studied in terms of student professionalization. A widely-used and ill-defined concept, professionalization is here defined as becoming a professional in a context of lifelong learning through competence development, culture appropriation, and identity construction. Focusing on innovative and professionalizing programs (IPP), this qualitative/interpretative research investigates whether and how such programs actually contribute to student professionalization. Participants were ten volunteers recently graduated from a selected IPP in electrical and computer engineering in a mid-sized French Canadian university. Semi-structured interviews were audio recorded and transcribed verbatim. Qualitative analysis involved data reduction, data displays, and conclusion drawing and verification. According to participants, the IPP mainly contributed to the development of competencies and the construction of their identity as engineers while their appropriation of the engineering culture was rather limited. As indicated in previous studies, problem-based methods had an effect on graduates’ sense of confidence and preparedness for the workplace. In this case, the IPP provided significant learning experiences which, in turn, contributed to different levels of professionalization. Such differences could be explained by individuals’ interest and experiences, and lack of explicit definition of student professionalization. Results generated by this study cannot be generalized but having developed a conceptual framework is fundamental for understanding and facilitating student professionalization in higher education.

Business internship advisors as key persons in school-to-work transitions

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In all existing vocational educational systems the kind of combination of practice-related and academic knowledge is a key issue for the development of vocational competencies. The modus of combination is quite different in various vocational education systems. One eminent characteristic is that all are bound to some form of crossing borders in terms of changing locations, communicative styles, social contexts, communities of practice and so on. However, there are some hidden assumptions included in all models of cross-border-learning which make us believe (!) that connectivity takes place - either supported by teachers and guides or solely in the learners’ minds. But in reality we don’t really know much about the determinants fostering or hindering connectivity. Our research focus is on business internship advisors who are supposed to play a central role in supporting connectivity between the world of school and the world or work. The presented quantitative empirical study was conducted in autumn 2011 in a Bavarian higher vocational school (Fachoberschule). Particularly we could gain more detailed knowledge on the kind of qualification business internship advisors have or would like to have, their positions and functions in the companies and in internship advisory, business internships advisors’ interpretation of their roles, their motivation and expectations, their perspectives on the usage of subject related knowledge learned at school in internships workplaces.

Fostering Learning Strategies in Vocational Training Courses for Low-Achieving Trainees
In Switzerland, two-year vocational education and training (VET) programmes with lower requirements are offered at the upper secondary level. They allow trainees whose academic or personal skills are not yet sufficiently developed to follow a higher demanding programme of three or four years to obtain a nationally recognised VET certificate. As these trainees often have learning difficulties, their self-regulation strategies should be strengthened so that they can acquire the necessary vocational competencies in the chosen trade and also improve their academic performance. Previous studies have shown that their learning strategies and performance at vocational school can be improved with a metacognitive training programme. The trainees’ self-regulation should ideally be fostered in all learning settings involved in a VET programme, i.e. work-based training in the host company, education at vocational school and training of vocational skills in industry courses. The aim of the study is to enrich the teaching and learning of practical vocational skills in industry courses for car mechanic assistants by embedding training components to foster task-related cognitive and metacognitive learning strategies of the trainees. Exploratory field observations showed that the industry course trainers did rarely encourage the trainees in this respect. In collaboration with a group of trainers, we therefore developed training components that are suited to the pedagogical setting of industry courses. The trainers’ subsequent, self-directed implementation of these components in their courses was documented and evaluated. The paper will focus on the design and implementation phase and corresponding results will be presented and discussed in detail.

Orchestrating inquiry learning: creating continuity between ideas and events across time

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This paper explores how cumulative knowledge-building is orchestrated and resourced over the duration of an extended technology-mediated scientific inquiry learning activity. A key educational challenge facing teachers working on such substantive inquiry projects is how to ensure that the overall educational experience for the students is one that is genuinely cumulative and reciprocal, rather than simply extended in time. The socio-cultural discourse analytic work (Mercer and Littleton, 2007) we present will explore how teachers create continuity between ideas and events across time and how they confront the complex issue of how to support and resource the development of linked ‘chains of inquiry’. The paper will also highlight how the affordances of the technologies in play distinctively enter into and resource the processes of connection building across phases of activity, such that from the learner’s perspective, the work they are undertaking begins to develop a cumulative quality in which specific activities, and their goals, began to form part of a greater whole - a purposeful educational ‘journey’ through which they come to understand the nature and processes of inquiry learning.

Learning by modelling: The effects of providing students with partially worked-out models

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Learning by modelling is often regarded as a productive way of learning but it is also recognised that students easily get overwhelmed by the complexity of the modelling task. In this study we aimed to scaffold domain novices with partially worked-out models on a modelling task in the complex biology domain of glucose-insulin regulation. A partially worked-out model could serve as a framework for model construction by showing the overall structure of the model. In this way the complexity of the task is reduced. Depending on the condition they were assigned to, students either received support in the form of a partial model that provides a structure of the model (PM condition; n = 26), an extended partial model that additionally provides a list of variables (PM+ condition; n = 21), or no support (control students; n = 23). Consistent with expectations, providing students with worked-out models enhanced students’ modelling behaviour, task performance, and learning; a comparison among the two partial model conditions confirmed the predicted superiority of the PM+ condition.

Epistemic complexity as a measure of inquiry progress in science education

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Inquiry-based learning (IBL) is highly promoted in science education to foster students’ understanding of concepts and of the paradigms in which the concepts were developed and assessed in the scientific community. Though generally highly motivating for students, IBL could fail reaching deep knowledge if students are not sufficiently guided in the inquiry process. The difficulty for teachers is to know when these guiding interventions are needed without lowering students autonomy in the investigation. In this study, we proposed to use epistemic complexity of the texts produced by the groups of students over time as an indicator of their progress in the inquiry process and understanding. The results showed that epistemic complexity increases both in absolute and relative value in students’ production. Moreover, the level of epistemic complexity in the final productions of the inquiry cycle is higher at the end compared to the beginning of the year. This findings suggest that epistemic complexity is an helpful indicator to assess the progress in students’ understanding over time and investigate the effect of instructional intervention in inquiry-based learning design.

School leavers and graduates: what do stakeholders in different European countries know about them?

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This project is ‘researching research’ as it collects information on data production and utilisation in relation to school-leaving. The issues raised in this investigation include the nature of measurement: what do we measure? How do we measure? How is the ‘evidence based policy making’ working in everyday life? What is the impact of the information collected in creating national and institutional policies, if any? The main areas of investigation are the leavers and graduates survey aims and their relation to the used methodology; how the research is financed and managed; and special emphasis
is put on the dissemination and utilization process. This paper draws on the three stages of the research; the first stage explores and describes the available school leaver and graduate survey programmes within Europe; the second stage involves three case-studies where the national characteristics of England, Finland and the Netherlands are examined and the third stage draws on one of the survey systems from England to show what is possible through using this sort of data collection.

**A Study on Philosophies of Teaching and Technology and the Relationship to Responsible Teaching**

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The purpose of this study was to explore the conceptions and attitudes (or the ‘philosophies’) that educators within the higher education sector hold of educational technology. Seventy-five participants were selected for the closed interviews; all were working in institutions of higher education whose discipline is education and field of study is teaching with technology. The outcome of this study was a framework for philosophies of educational technology in higher education. As educators, it is important to reflect on, and identify, our teaching philosophy. Knowing our teaching philosophy helps us to understand why we act and think the way we do in our everyday classrooms, including our choices about teaching (or not) with technologies. Knowing our philosophies provides us with the ability to understand the consequences of our choices, as well as the effect that our philosophical orientation has on our learners. To know our philosophical orientations about teaching and technology, and make it transparent, is quite simply: responsible teaching.

**Operationalizing teachers’ psychological ownership of reform curricula**

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Teachers’ ownership of educational innovations, such as inquiry-based learning, is extremely important to the sustainability of the innovation. Despite its importance, teacher ownership remains an elusive construct which has not received much empirical investigation. Drawing from related literature in psychology, the present study operationalizes teacher ownership of computer-supported collaborative inquiry as a multi-dimensional construct composed by five components: (a) personal beliefs, (b) outcomes efficacy, (c) self-identity, (d) belongingness and (e) sustained interest. To explore the empirical validation of ownership of inquiry-based learning we employed a multi-case approach, examining two secondary school science teachers as they underwent a process of participatory design and subsequent implementation of an inquiry, computer-supported module. Data were collected during the implementation phase and included videotapes of the enactments and reflective interviews with each teacher after each lesson. The analysis of the post-lesson reflections allowed us insights into understanding how each teacher’s ownership developed as the enactment unfolded. A variety of factors were recorded as positively or negatively affecting each of the five ownership components. Findings suggest that the teaching intervention served as a
transformative period during which we observed a gradual shift from negatively-valued to positively-valued ownership. The findings of this study, along with supplementary analyses of the interactions during enactment, can contribute to a more nuanced understanding teachers' psychological ownership of reform curricula and can support efforts to sustain innovations over time.

**Student Evaluation of Teaching: Perceptions of College Students**

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Student evaluation of teaching has been widely implemented in higher education institutions as a form of feedback for faculty and course effectiveness despite hot debates concerning its validity and reliability. The aim of this study was in general to unveil the needs for the improvement of the implementation of student evaluation of teaching particularly in the case of a higher education institution in Turkey. To achieve this end, a sample of 121 college students was surveyed to gather their perception regarding student evaluation of teaching. Results offered implications for the improvement of validity of the student evaluation of teaching in the electronic environment and suggestions for the increase in the number of students participating in student evaluation of teaching.

**The use of portfolio for connecting professional experience and (re)entry in educational pathways**

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The paper seeks to investigate the educational and guidance dimensions of the portfolio construction within a guided process for the development of awareness of competences for adult working students (re)entering university. The aim was to focus on long term effects of the autobiographic reflective process from both students’ and academics’ points of view, using follow-up semi-structured interviews. The content analysis showed that: the reflective writing stimulates a (re)appropriation of the cognitive and operative passages implemented by the past experiences, underlining the educational needs; the portfolio has been perceived as stimulus towards the reconstruction of the linking threads and their coherence and so towards the development of a more holistic identity; to make a reflective balance may give the possibility to enter a process of change in perspective of empowerment. The study suggests that the portfolio can be a useful tool for connecting people’s professional experience and their re-entry in education. Main references Alheit, P. (2009). Biographical learning, within the new lifelong learning discourse. In K. Illeris (Ed), Contemporary theories of learning: Learning theorists... in their own words (pp. 116-128). London: Routledge Feutrie M. (2000), France: the story of La Validation des acquis/recognition of prior experiential learning in Evans N. (Ed) Experiential learning around the world. Employability and the global economy, London and Philadelphia: Jessica Kingsley Kolb D. (1984) Experiential learning, Englewood Cliffs: Prentice-Hall Paul M. (2010), L’accompagnamento. Una specifica postura professionale, in C. Biasin, L’accompagnamento. Teorie, pratiche, contesti, Franco Angeli: Milano

**Problems in academic writing – The case of Open University beginning educational science students**
The focus of this paper is on variation in Open University students’ academic writing skills at the beginning of their studies in educational sciences. Academic writing skills are here viewed in terms of how well students are able to conceptualise a given topic when they have access to referencing materials. Essentially, we have looked at how the students construct their arguments and use the source materials available. The data were analysed using inductive and deductive content analysis. The results show that many students start their university studies with weak academic writing skills. While many of the problems were directly related to the lack of produce a coherent text and resulting problems in citing sources, some of the problems pertained to other aspects, such as the inability to build an argument and logical fallacies. Understanding of the qualitative nature of the problems students expose in their writing will help teachers of academic writing to intervene at an early stage and to design teaching to optimally support the students’ learning process.

Measuring teaching practices of teachers in higher education: a review study of the period 2001-2012

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By this review study we build on the critiques that the quality of teachers’ teaching practices is too often mapped by self-report instruments which can give a distorted image on the teachers’ actual teaching practice. This review study provides a state of the art of research studies performed within the period of 2001-2011 on teaching practice of teachers within institutes for higher education. We analyze which methods are used to measure teachers’ teaching practices, to which extent research studies are aware of the limitations of self-report instruments and how they deal with these limitations. Next to this we analyze more deeply the research studies that have applied non-self-report instruments on their research design and results.

Harnessing Technology for Integrating Multiple Learning Environments in Undergraduate Art Education

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One of the most challenging aspects of Art education is in helping students develop the skill to analyze artwork. The Cognitive Apprenticeship framework explains how novices can develop skills by learning from experts, and suggests that the role of the instructor, as an expert, should transform over time through three phases: modeling, coaching and fading-away. The purpose of this research was to develop and examine an instructional-model, which harnesses innovative technologies and local resources (an in-campus museum), to support undergraduate-level Art students in developing the skill to analyze artwork. An instructional-model was designed in which each of four major topics was taught through a sequence of learning sessions spanning over three learning environments (classroom, museum, home), with technology supporting the flow of information between them. A case-study approach was used to collect rich data from two full enactments of the course in one semester, taught by one instructor to two cohorts of students. Findings indicate that the instructor gradually decreased her own activity (modeling and coaching), to enable students to become more active. We conclude that the instructional model and the underlying technological infrastructure, served as a key enabler for the instructor to provide students with opportunities to practice their skills with her guidance, and eventually to develop independence in analyzing artwork.

Autonomy support and achievement goals as predictors of school performance and life satisfaction

A self-determination theory (SDT) perspective on motivation presupposes that perceived autonomy support is related to several factors that are important for learning and well-being among students. In the present study, a representative sample of 2,594 Norwegian students in 10th grade secondary school and 1st grade high school responded to a survey measuring the students’ perceptions of their teachers’ autonomy support, achievement goals, perceived school performance, and life satisfaction. The purpose of this study was to investigate the relation between these variables and how they may be related to grade level (10th grade secondary school vs. 1st grade high school). The results showed that all achievement goals (mastery, performance approach and performance avoidance) were predicted by autonomy support. Furthermore, perceived school performance and life satisfaction was predicted by autonomy support and achievement goals. Students in 1st grade high school had a higher mean level of all motivational variables. In conclusion, both academic achievement (perceived school performance) and life satisfaction are related to the students’ perception of teachers’
autonomy support as well as the students’ own motivation for learning. However, the mean level of these variables is partly accounted for by grade level.

**The relative importance of work-related learning goals across the career: does age really matter?**

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In ageing societies, which are characterized by an ever-changing labour market, lifelong learning is a core career competence. Based upon the study of Zacher et al. (2009), this paper investigates the relative importance that workers accord to work-related learning goals depending on their chronological age. This present study was conducted with a sample of Belgian workers aged between 18 and 65 years. We aim to understand the potential influence of chronological age on the importance of learning goals. We also consider other individual variables that could be related to the importance accorded to learning goals, such as work centrality and proactive personality. Preliminary analyses show that when controlling for individual variables (proactive personality, work centrality), the negative relationship between age and importance of learning goals diminishes. More importantly, job tenure is a better predictor of learning goal importance: the amount of years working in the same job is negatively related to the importance of learning goals, even when controlling for personality variables. Keywords: workplace learning, personal goals, work goals, motivation to learn, age, job tenure

**Want to be a good teacher every day? Latent state-trait analyses of teachers’ goal orientations**

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Teachers’ goal orientations are typically considered to be stable characteristics. However, empirical investigations regarding this assumption are rare. In the present study, we investigated the stability of teachers’ goal orientations (i.e., mastery, performance approach, performance avoidance, and work avoidance goal orientation) using latent state-trait modeling. The sample comprises 164 mathematics teachers in academic-track secondary schools who completed self-report questionnaires (see Nitsche et al., 2011) three times over the course of one school year. Results indicated that, for all goal orientations, the stable proportion of reliable variance was (much) larger than the occasion-specific proportion of reliable variance. Additionally, teachers’ mastery goal orientations were much more stable than their performance goal orientations. The results reveal insights into the nature of teacher goal orientations and thus help in developing the theoretical understanding of teacher motivation.

Achievement Goals, Emotions, and Foreign Language Performance in German and Korean Students

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This study examined cross-cultural differences in achievement goals and emotions in foreign language learning (FLL) among high school students in Germany and South Korea. Furthermore, this study investigated the relationships between 1) achievement goals and emotions, 2) achievement goals and academic performance, and 3) achievement emotions and performance in the English domain. We also examined the mediational role of emotions in the relation between goals and performance. Students from Germany (N=200; age 14 to 18 years) and Korea (N=228; age 15 to 18 years) completed the Achievement Goals Questionnaire-Revised, the Achievement Emotions Questionnaire-Language, and an English performance test. Based on the results of multi-group confirmatory factor analyses, multi-group structural equation modeling was performed to test hypotheses, ensuring measurement equivalence across the two countries. Enjoyment, hope, pride, anger, and boredom were higher in German students, whereas anxiety, shame, and hopelessness were higher in Korean students. In line with the theoretical model on achievement goals and emotions proposed by Pekrun et al. (2006), the results showed specific links between mastery-approach goals and activity emotions, performance-approach goals and positive outcome emotions, and performance-avoidance goals and negative outcome emotions. Furthermore, mastery-approach
and performance-approach goals positively predicted academic performance, whereas performance-avoidance goals negatively predicted performance, with the link between mastery-avoidance goals and performance not being significant. As expected, positive emotions were positively, and negative emotions were negatively related to performance. Achievement emotions were documented as mediators of the relation between goals and performance. Unexpected results are reported in terms of cross-cultural comparisons of goals.

**High school students’ science learning self-efficacy and their conceptions of learning science**

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In the past, students’ science learning self-efficacy (SLSE) was usually measured by the questionnaire that consisted of only one single scale, which might be insufficient to fully understand their SLSE. In this study, a five-dimension instrument (SLSE instrument) including ‘Conceptual understanding,’ ‘Higher-order cognitive skills,’ ‘Practical work,’ ‘Daily application,’ and ‘Science communication’ was adopted to assess 404 Taiwan high school students’ SLSE. Besides, the interrelations between students’ conceptions of learning science (COLS) such as ‘Memorizing,’ ‘Testing,’ ‘Calculating and practicing,’ ‘Increase of knowledge,’ ‘Applying,’ and ‘Understanding and seeing in a new way’ and SLSE were explored. 404 Taiwan high school students (208 male and 196 female) were invited to respond to SLSE and COLS instruments. Through Pearson correlation analyses, the findings unraveled that the students who believed science learning as ‘Increase of knowledge,’ ‘Applying,’ and ‘Understanding and seeing in a new way’ tended to possess higher SLSE. Yet, in general, the students who viewed science learning as ‘Memorizing,’ ‘Testing,’ and ‘Calculating and practicing’ were prone to possess lower SLSE. The regression results also indicated that, to all the five SLSE dimensions, the COLS as ‘Understanding and seeing in a new way’ had a noticeable positive effect, while the COLS as ‘Testing’ was a significant negative predictor. The results suggest that the over-emphasized high-stakes standardized examinations at both the school and national levels in Taiwan may result in discouraging students to be self-efficacious in learning science. Also, science educators are encouraged to engage students in meaningful learning about science to enhance their SLSE.

**The Impact of Self-Efficacy on Conceptual Change: A Study in Astronomy**

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Contemporary conceptual change models include more than just content knowledge. They also focus on motivational constructs and the connections between motivation and knowledge reconstruction. One of these—self-efficacy—may be especially relevant to conceptual change in astronomy topics, but to our knowledge it has not been empirically investigated. In this study, we examined the relationship between students’ self-efficacy for learning about astronomy and changes in their understanding about stars (as measured by the Star Properties Concept Inventory, or SPCI). Approximately 1000 undergraduate students enrolled in general education astronomy courses responded to surveys at the start and end of their semester-long course. A hierarchical multiple regression analysis of the data shows that although prior knowledge (SPCI pretest) and pretest self-efficacy have a large impact on conceptual change, self-efficacy at postinstruction makes a larger impact on conceptual change. Both knowledge (SPCI) and self-efficacy improved significantly over the course of instruction. Variations across instructors suggest differences in course design may affect self-efficacy, and those courses that facilitated increases in self-efficacy subsequently demonstrated the largest knowledge gains.

Could the use of ICT in class impact teachers’ perceptions of self-efficacy?

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This paper presents and discuss a mixed method research study on Greek teachers’ use of technology, particularly tools of Web 2.0, in their class. The research study aimed to explore whether there is a connection between the use of technology as teaching aid and teachers’ perception of efficacy. There is a body of research in Greece discussing the use of technology in class, as well as strengths and obstacles. In most cases the use of technology is seen as a mean for meeting particular educational / learning goals. This study aims to explore whether the use of technology in class, besides its educational impact, affect also the way teachers themselves perceive their professional role, as well as personal notions of teaching efficacy. As a concept efficacy is very important because, as other studies show, it functions as a predictor of how teachers will go on with their teaching, affecting their professional and personal identity. Data for this paper will come from analyzing the answers to a research questionnaire that was distributed electronically to Greek teachers on the autumn of 2012, as well as from individual interviews with in-service primary school teachers that will take place on early spring of 2013.

Student Identity and Its Relations to Prospects of Personal Future and School Performance

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Identity refers to who people think they are, where they come from, or belong to. Our purpose has been to develop an inventory to measure and describe the identity status of school students. In the paper we analyze the results of an identity scale, the Adolescent Personal Identity Resolution Scale (APIRS), developed for this purpose. The study belongs to the European Union project looking ways to promote school students’ pro-social school behavior in the school context. Our research questions were: 1) what is the identity status of school students in the studied European schools? 2) How and in what dimensions do the students from different countries differ? 3) What is the relation of identity scales to the students’ expressed prospects of their future and their school performance in different subjects? A non-probability sample was collected from five secondary schools in Hungary, Portugal, The Netherlands, Turkey and Finland. The number of subjects from each country is three classes. The total of subjects is 370. We hypothesize that identity relates to personal life choices and future plans in many ways. It may also relate to personal resources, such as creativity. As demographic questions we asked subjects their gender, age, school grade level, and grade point average. We assume on the basis of the pilot study that demographic variables relate significantly with the identity scales. It is necessary to understand students’ school performance to develop both curriculum and instruction. On the basis of results believe that student identity has an important role in school success and students’ future plans. Result will be discussed in detail in the paper.

**Linguistic and metacognitive predictors of low achieving adolescents’ reading comprehension**

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The aim of this study was to analyze the associations between lower order skills, higher order skills, and reading comprehension ability in low achieving adolescents, and to examine whether these associations differed for students in different grades (grade 7 vs 9) and between first and second language students. 328 low achievers from 23 classes in 13 schools were administered a word decoding test, a vocabulary test, a metacognitive knowledge test, a reading comprehension test, and a language questionnaire. Multilevel analyses first of all showed significant, positive effects of vocabulary and metacognitive knowledge that were consistent across grades and L1 and L2 students. Additionally, they revealed a significant cross-level interaction effect of grade and word decoding. The latter implied a significant, positive effect of word decoding for seventh graders, but a nonsignificant effect of word decoding for ninth graders. Finally, we found that, when vocabulary knowledge was controlled for, there was a significant, positive effect of being an L2 student on reading comprehension. These results suggest that, for low achieving adolescents, vocabulary training and metacognitive training are beneficial ways of furthering their reading comprehension skills. Based on the positive effect of L2 status on reading comprehension, we suggest these students may have a ‘hidden potential’ that can be activated when their second language vocabulary knowledge is enhanced.
Improving Word Reading Speed: Focus on Successes or Failures?

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The effect of two training procedures on the development of reading speed in poor readers is examined. One training concentrates on the words the children read correctly (successes), the other on the words they read incorrectly (failures). Children were either informed or not informed about the training focus. A randomized controlled trial was conducted with 79 poor readers. They repeatedly read regularly spelled Dutch CVC words, some children their successes, others their failures. The training used a computerized flashcards format. The exposure duration of the words was varied to maintain an accuracy rate at a constant level. Reading speed improved and transferred to untrained, orthographically more complex words. These transfer effects were characterized by an Aptitude-Treatment Interaction. Poor readers with a low initial reading level improved most in the training focused on successes. For poor readers with a high initial reading level, however, it appeared to be more profitable to practice with their failures. Informing students about the focus of the training positively affected training: The exposure duration needed for children informed about the focus of the training decreased more than for children who were not informed. This study suggests that neither of the two interventions is superior to the other in general. Rather, the improvement of general reading speed in a transparent orthography is closely related to both the children's initial reading level and the type of words they practice with: common and familiar words when training their successes and uncommon and less familiar words with training their failures.

The role of different forms of cohesion and readers’ expectations towards different types of text

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The improvement of sustainable text comprehension is one of the most important challenges as written texts are integral to our system of education. Unfortunately, many students face difficulties in understanding texts because reading comprehension stagnates on the surface code instead of constructing a mental model (Kintsch, 1998). Empirical research has pointed to various reader characteristics and text features, such as cohesion, as important foundations for reading comprehension. However, these studies do not agree on how reader characteristics and text features interact and do not investigate the influence of different forms of text cohesion and readers’ expectations towards different types of text (O’Reilly & McNamara, 2007; Ozuru, Dempsey & McNamara, 2009; Voss & Silfies, 1996). This presentation provides a better understanding on how specific forms of local and global text cohesion interact with reader characteristics and which role
readers’ latent expectations towards types of texts play. 800 students attending German comprehensive schools, 9th grade, read a high or low cohesive text with expository or literary instruction. The students’ comprehension is measured offline via MC and open ended questions. In addition readers’ genre expectations, topic relevant prior knowledge, reading skill, interest, SES and cognitive ability are assessed. We expect that the degree to which participants benefit from reading a locally and globally high-cohesive text depends on participants’ reading ability and prior knowledge. Further we anticipate that text cohesion is less relevant when reading the text in the literary mode.

Cognitive and linguistic correlates of spelling in English among Chinese children

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Children are expected to master the important skills of reading and spelling in English for which they learn as either a second language or a foreign language. Limited research has been conducted to examine the underlying cognitive-linguistic skills of spelling among Chinese children who learn English as an L2. Learning to spell in English requires vocabulary, verbal memory as well as metalinguistic skills because the mappings are more complex and irregular. The present study aimed to investigate the relationship of children’s English spelling ability and underlying component skills in Hong Kong Chinese kindergarteners who learn English-as-a-second language (ESL). Measures of spelling, phonological awareness, verbal short-term memory (STM), rapid automatized naming (RAN), oral vocabulary and letter naming in English (L2) were administered to 136 5-year-old children. As expected, phonemic awareness was significantly associated with spelling. With age, general intelligence, phonemic awareness and letter naming statistically controlled, RAN and expressive vocabulary were significant predictors of spelling but verbal STM was not. The findings support the view that phonemic awareness is an important early predictor of spelling. The contribution of vocabulary and RAN in L2 spelling is highlighted by the present study.

Grammar instruction to improve writing skills: some tendencies on teachers’ beliefs and practices

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gu53tiv 11.9999 The present study is part of a larger research in the Barcelona metropolitan area (Spain) about the effects of grammar instruction on students’ writing skills. One of its objectives is to identify teachers’ tendencies and to explore their beliefs. We have elaborate a questionnaire addressed to Primary and Secondary teachers focused on how teachers position themselves regarding knowledge, practices, methodologies, and what teachers think their students expectations are regarding grammar instruction. The analysis we follow is quantitative and the data was processed
with SPSS program. Preliminary results suggest the existence of different tendencies among teachers, especially highlighting the importance to attend the following three main aspects: what grammar to be taught, how to teach it, and what students’ expectations are.

**Speaking and writing in children’s writing together and the impact on knowledge construction**

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Children who are writing together to accomplish an informative and/or persuasive text, have to make decisions on the packaging of the utterances and to discuss the intended content. During that process they are discussing the relationship between content aspects and are inferring on the basis of each other’s suggestions and statements. These are all components of knowledge construction (Bereiter 2002, Mercer & Littleton 2007). Our main research question for this paper is: What is the relationship between the discussions and the written texts the children produce together? We will demonstrate how the context of collaborative writing is supporting the thinking-together process. But we will also show that the first writing products in this context lack coherence. The writing-to-learn effects are only seen in the discussions that are preceded or come together with the writing activity in this context. So we conclude that revisions on the coherence of texts that are written together, are necessary, to get a complete picture of what is constructed by the children. The data are taken from 5 schools, in grades 4-6, while the children were working on a research topic for 3 weeks. The conversational data of the collaborative writing work is video-taped and transcribed. The qualitative analysis of the discussions is based on the CA methodology (Ten Have 2007). For the coherence analysis of the written texts, we used the model of Spooren & Sanders (2008).

**Causal Reasoning and Text Comprehension**

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Understanding causal relations is important in everyday life, for example, for text comprehension. In the present study we tested, a) if findings in teaching mathematics on the superiority of first providing abstract principle instantiations, can be applied to the field of causal reasoning, and b) if providing learners with explicit causal relations in texts facilitates performance on concrete causal relation tasks, potentially even overriding advantages of an abstract-instantiations first procedure. We applied a 2x2 design: Concrete vs. abstract causal problems first and texts with vs. without explicit causal relations. In line with studies in mathematics education we found that while concrete instantiations might be perceived as less difficult, this ‘feeling’ did not manifest in better performance on concrete problems or transfer from concrete to abstract problems. Our data do
indeed indicate an advantage of working on abstract problems first, that is, there was only evidence for transfer of principles from abstract to concrete tasks but not vice versa. Variations in texts did not result in significant differences. Implications for training causal reasoning are discussed.

Activities of writing as mediational means in a teacher program

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This paper draws on a Norwegian study investigating textual cultures and the role of writing in a one-year initial teacher program in Norwegian language didactics. The paper addresses how activities of writing work as mediational means in student teachers’ learning. For the purpose of identifying different conceptualizations of writing, three metaphors will be used: writing as reporting, writing as interpreting, and writing as constituting. Our analysis shows that the textual culture in class continuously generates distinctions and critical reflections regarding different functions of writing. All the different metaphors of writing are carefully introduced and involved in writing activities. The activity of portfolio writing appears as the most important mediational means in enhancing critical reflection upon the student’s role as future Norwegian teachers, as it makes students elaborate on experiences from their internships and university courses. However, this does not count for the final mark, and is seen as ‘less important’ by the students. The academic essay (that counts for the final mark,) is supposed to be written in a way that corresponds with writing as reporting, a metaphor that also is heavily advocated by most of the internship mentors. Our findings underline the importance of institutional relationships of power and authority in program related contexts; such relationships forms important mediational means in student’s learning trajectories and their conceptions of writing.

Teachers’ professional development using classrooms videos: insights from two case-studies in Chile

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One of the main difficulties to accomplish successful teachers’ professional development programs worldwide is related to the gap between theory and practice (McIntyre, 2005). The case of Chile is not the exception. In this paper we discuss two case-studies, exploring the use of classroom videos as a tool to bridge the gap in continuous education in Chilean public schools. Communities of learners formed by teachers and university researchers use videos as a tool for reflection, focusing on teachers’ and students’ thinking. Using mixed methods, we analyse the effects of the program regarding teachers’ practices (pre-post classroom videotapes) and their professional vision (pre-post analysis of a classroom video clip). We also included an analysis of videotapes from the program’s meetings. The results show an overall improvement in the pre-post evaluations, although wide individual variation was found. The meetings’ analysis gives insights on how the learning process unfolded. These findings suggest positive effects of the professional development program, and point to individual and school-level characteristics that could mediate teacher learning in the context. We discuss issues related to the design, the differences in the contexts in which the studies were conducted, and individual differences. Also, we highlight the relevance of generating such reflection communities, in which both teachers’ and researchers’ practices are enriched.

Personal epistemologies and workplace learning: An empirical exploration

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The study presented in this paper is part of a broader research project aiming at a better understanding of the relationships between some personal beliefs, context affordances and individual dispositions. This project is structured into two phases: (1) an exploratory study to better understand the consequences of some personal beliefs for workplace learning; (2) a wider study to test some specific hypotheses emerging from the exploratory phase. This proposal concerns the preliminary study (phase 1), as the data collection process of phase 2 is not yet completed to date. However, the first results of the phase 2 could be presented in the final paper. More specifically, in this paper, we wish to explore the interaction between employee’s and organisation’s epistemological beliefs and its impact on the individual’s learning in the workplace. We assume that a discrepancy between individual beliefs and organizational beliefs may have a negative impact on the employee’s learning. In other words, we want (1) to better understand the functioning of epistemological beliefs in case of discrepancy and their impact on learning for the employee; (2) to identify individual and organizational factors that could regulate this impact.

Video stimulated recall to increase teachers’ awareness of gender related classroom interaction

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It is suggested that teachers work from a gender-blind position (Garrahy, 2001). Teachers claim not to interact any differently with boys than with girls. However, an examination of the literature base on gender imbalances in student-teacher interaction shows—sometimes contradicting—unequal interaction patterns for boys and girls (e.g., Beaman, Wheldall & Kemp, 2006; Jones & Dindia, 2004). Several studies emphasize the need to further investigate the effectiveness of interventions aimed at raising teachers’ awareness and reflection on gender-related interaction (e.g., Myhill, 2002). In this study, observation (N=30) and video stimulated recall interviews (N=15) with secondary education teachers are used to investigate teachers’ own practice in relation to issues of gender, teaching, and learning. Videotaped lessons are analysis from both the researchers’ and the teachers’ perspectives to help teachers become aware of differences in positive, negative, social, and academic interactions to boys and girls, and of the thoughts, images, and emotions that evoke these interactions. Quantitative analysis of the videotapes and qualitative content analysis of teachers’ recall and reflections support the suggestion that teachers are unaware of the gender differentiated interaction patterns that are observed in their own lessons. Video stimulated recall alone does in many cases not lead to a significant increase of teachers’ awareness of gender-differentiated student-teacher interaction. Additional in-depth video stimulated reflection with a more prominent intervention and guidance of the researcher are often required.

**Improving teacher efficacy in relation to challenging student behavior through collaborative design**

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Improving teacher efficacy in relation to challenging student behavior through collaborative design of interventions. In mainstream primary and secondary education, teachers are faced with the challenge to serve a wide range of educational needs. Dealing with problem behavior is a particular challenge for many teachers. This study was set out to explore the changes in teacher efficacy in relation to challenging student behavior, while teachers participated in a professional development project in which they analyzed challenging classroom situations, designed, implemented, and evaluated specific interventions. Results show an increase of teacher efficacy in relation to disruptive and
problem behavior. Teachers attributed their gains in self efficacy to their participation in the project. Aspects that were reported to be of particular influence on the gain in teacher efficacy were analyzing video recordings of teaching practice, and collaboration with colleagues, i.e. consulting fellow teachers. The findings of this study offer further insight in methods of improving teacher efficacy, particularly in relation to student behavior. In turn, effective methods for continuing professional development will have a positive impact on school practice and effectiveness.

A process perspective on marking and feedback provision

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This study focuses on the process of marking. In particular, attention is paid to relatively neglected aspects in the literature: feedback construction, individual approaches and marking a series of scripts. Interview data was gathered from twelve HE participants that lectured on different subject areas. The results show that multiple re-readings are typical in the process of marking and feedback construction; formulating a mark is commonly an iterative process. A variety of approaches were found in the construction of feedback depending on which aspect of feedback is perceived to be of greater significance (synoptic feedback or detailed annotations). A range of strategies were found to maintain self-consistency when marking an entire set of scripts. These differences in the marking process have implications for quality assurance and staff development.

Electronic portfolios to mindfully scaffold student teachers’ development of expertise

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This mixed-methods study focuses on student teacher learning, exploring the use of electronic professional portfolios during practicum-based semesters. Phase One consisted of developing and pilot testing a version of an electronic portfolios software specifically for pre-service and in-service teachers (n=37). In open-ended questions and interviews, student teachers reported liking reflecting and being able to align their work to competencies but disliked the confusing interface with multiple features and flexible navigation. Still, strong portfolios effectively demonstrated student teachers’ competencies and reflective abilities. Phase two explores whether students’ orientations toward learning to teach (Oosterheert, Vermunt, & Veenstra, 2002) relate to their satisfaction or engagement using EPs (estimated n=90 from 4 courses). Multiple-regression analyses will be followed by a qualitative cross-comparative analysis of interviews with and portfolios of representative participants (n=8).

Collaborative learning experience of student teachers in terms of knowledge communities with experts

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Abstract Collaborative learning is supporting the basic idea of learning with others and in the communities of experts. It is taken for granted that teachers who are experts of teaching will adopt automatically new pedagogical models in their practice. We are well aware that students’ and teachers’ long school history influences on their beliefs and assumptions on teaching and learning by supporting old pedagogical traditions. Further, we do know that teachers are not adopting new pedagogical models in their teaching unless they have gathered positive and long period experiences on these kinds of approaches. In this paper we are presenting a study, where we are investigating student teachers’ earlier experience on the use of expert communities in their learning before and during their university studies mainly through questionnaires. Three clusters of student teachers were identified: those that are Cluster 1 ‘Social media oriented’, Cluster 2 ‘Visiting oriented’, and Cluster 3 ‘Negatively oriented’ towards using expert communities and social media in their teaching profession. The results revealed that teacher students’ earlier experience seems to influence on their perceptions; having less experience is connected to negative perceptions for using experts in their future teaching. Based on the results we will discuss how teacher education institutions might provide that kind of teaching to student teachers so as to encourage collaborative working with expert communities and positively affect student teacher approaches to their learning and responsible teaching.

Collaborative learning during teaching practicum: Examining student teachers’ lesson plans

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Abstract Instructional planning is perceived as an important process in the professionalization of teachers given the merits of anticipatory reflection. With regard to the implementation of a complex
instructional strategy such as collaborative learning (CL), a thorough lesson preparation becomes even more important. The present study aimed to investigate the quality of lesson plans focusing on CL implementation. Based on the literature, a scoring rubric with 17 criteria in 3 domains (instruction, organisation, and evaluation) was developed and applied to analyse 323 lesson plans of second-year student teachers. The results reveal both strengths (e.g. designing appropriate learning tasks, developing adequate learning materials) and weaknesses (e.g. including social objectives, rules, and agreements for collaborative work) in the lesson plans. The rubric proves to be a useful instrument both for research and practice-oriented reflection. The findings provide significant insights for teacher education with regard to CL implementation.

The articulation between teachers’ beliefs, classroom management practices and teaching experience

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An optimal learning environment, characterized by high levels of autonomy-support and structure (Jang, Reeve, & Deci, 2010), creates a context which helps promoting students’ intrinsic motivation, feeling of autonomy, and competence beliefs, all important educational goals. Research indicates that multiple factors affect how teachers decide to manage their classrooms, notably self-efficacy beliefs, beliefs about student motivation, and general conceptions about teaching and learning (Woolfolk Hoy & Weinstein, 2006). These factors have however rarely been considered jointly and the role of teaching experience often neglected. Accordingly, the aim of this study is to investigate how teachers’ beliefs, classroom management practices and teaching experience are associated, and which aspects create a desirable learning environment for students. 154 in-service VET teachers completed a set of translated and adapted scales and vignettes assessing the variables of interest. Path analysis’ results indicate that general conceptions about teaching and learning have an indirect effect on classroom management practices, via teachers’ beliefs about students’ motivation. Moreover, teacher self-efficacy (for student engagement and for classroom management) explains autonomy support and structure, both of them favorable classroom management styles. Finally, teaching experience helps teachers develop constructivist beliefs and self-efficacy, which should lead, according to our results to increased autonomy-support and structure. Implications for teacher education and research will be discussed.

From teachers’ judgments to students’ categorization

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Different approaches exist to uncover student categories in teachers’ beliefs and knowledge. One of these approaches suggested by Hofer (1981) consists in asking teachers to evaluate their students on different variables included in judgment scales. Using cluster analysis, Hofer (1981) shows that teachers’ knowledge and beliefs about students contain a 5 profile system. Given that the results of other research criticizes this approach (e.g. Oldenb&\#xf7;ger, 1986; Wanlin & Schaub, 2012), the aim of this contribution is to replicate Hofers’ methodology to examine if a 5 profile system could be identified in another context. Thus, this categorization approach is also analyzed to determine if it is a relevant means to uncover student categories in teachers’ knowledge and beliefs. Two
complementary tasks were designed for this purpose: teachers attributed a profile to their students and estimated their proximities to the attributed and non-attributed profiles. Results show that judgment data can be clustered into a 3 profile system and that teachers attributions aren't perfect (67%). The distance estimations show that teachers have difficulties to delimitate student profiles that are less favorable. These results contribute to the examination and the optimization of teachers’ diagnostic competencies during classroom interaction.

The relation between teachers’ beliefs and practice in course planning

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It is largely assumed that teachers’ knowledge and beliefs (e.g., teachers’ self-efficacy beliefs) determine teachers’ planning practices (Borko & Shavelson, 1990). Teachers plan for various reasons including pedagogical, personal and/or curricular purposes and begin the planning process with different starting points: defining the objectives or choosing the task to provide to the students (Clark & Peterson, 1986). Different evolution profiles were identified in teacher planning practices: some student teachers keep on beginning with defining the objectives to be sure to cover the whole program contrary to other ones, with more robust self-efficacy beliefs, who prefer to choose the learning tasks to ensure a better adaptation to students’ needs (Kagan & Tippins, 1992). The aim of this contribution is to examine the links between teachers’ knowledge and their practice in lesson planning. 154 teachers completed four questionnaires about (1) their adhesion to constructivist versus traditional teaching, (2) their self-efficacy beliefs in lesson planning, (3) their beliefs about what makes planning important, and (4) their preferred starting point when they plan lessons. Results indicate that traditional teaching views are associated with planning purposes focusing on curriculum coverage and composition of learning activities. The structure of constructivist beliefs is more complex as they are associated with curricular and pedagogical purposes, choosing learning tasks and defining teaching objectives, and higher self-efficacy. These results are of importance as they highlight that the links between general pedagogical knowledge/beliefs and teaching practices are not direct but mediated by teacher specificities.

Teacher self-assessment of differentiation strategies recommended by experts

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In primary school classrooms, the academic performance level of the students typically spans more than one grade level. To deal with this heterogeneity, the Dutch government requires teachers to adapt their lessons to the varying educational needs of their students ('differentiation'). Earlier research has indicated low teacher self-efficacy for differentiation and low usage of differentiation strategies (Skaalvik & Skaalvik, 2007; Tomlinson, Moon, & Callahan, 1998). This study investigates how Dutch primary school teachers self-assess their use of strategies identified as essential for differentiation by a consortium of educational consultants. Based on expert consensus on a cycle of differentiation (identifying educational needs, differentiated goals, instruction - elaboration, evaluation), a Differentiation Self-Assessment Questionnaire (DSAQ) was developed with one subscale for each step of the cycle. 158 teachers from 32 schools completed the DSAQ along with scales for other dimensions of self-efficacy. In support of convergent validity, the DSAQ total score correlated strongly with the subscale self-efficacy for adapting instruction to individual students' needs (r = .75, p

Didactic Dissonance-Teacher Roles in Computer Gaming Situations in Kindergartens

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In computer gaming situations in kindergartens we find that the pre-school teacher`s role can be placed on a continuum where we on the one extreme find the teacher who tries to take an intervening role in the computer gaming situation and on the other extreme the teacher who chooses to restrict herself to be the organizing or distal teacher. Our study shows that the intervening position is a challenging didactic role since it entails an invasion of the interactivity between the game and gamer. The organizing teacher role which is restricted to planning, arranging and providing the didactic situation, is as well a challenging role since it positions the teacher on the outside of the activity. We have suggested the term didactic dissonance to capture these tensions that arise in didactic situations primarily because the participants (teacher and child) encounter the computer gaming situation with different roles, functions and expectations. An intermediate position where the teacher is a contributor as well as an encouraging bystander without adding educational constraints to the childrens` play, is an alternative teacher role. By including her/himself in the interactive dramaturgy taking place between the child and the computer game, she respects the fictional interactive contract between the game and the gamer instead of intervening in a way that disturbs the flow of the gaming situation. The paper suggests that didactic dissonance may be a concept through which practitioners can reflect on teacher roles in didactic contexts.

Teachers’ Contribution to the Social Life during Learning Sessions in Finnish Preschool Classrooms

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This study was designed to analyze and understand the role of teachers’ practices in creating and enhancing social life in Finnish preschool classrooms during teacher-led learning sessions. Observational data of 20 preschool teachers were analyzed according to the principles of thematic analysis. Four identified themes indicated teachers’ practices on (1) managing children’s peer-relations; (2) managing the coherence of the group; (3) emphasizing the role of individuals in group; and (4) discussing friendship and respectfulness. Findings suggest two types of teacher support provided for social life; one focusing on managerial and organizational aspects and the other on emotional aspects of social interactions. In addition, teachers provided children with opportunities to interact in differing group compositions. The findings clarify the concept of social life in preschool education, and are useful for raising teacher’s awareness of the importance of social life, especially when transitions to new educational contexts are timely.

Benefits of extracurricular participation - Combined effects of structured & unstructured activities

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Participation in extracurricular activities has been shown to affect social behavior and academic achievement positively. Studies investigating extracurricular participation focus not only on the effect of a single activity but also on the breadth of activities. However, these studies merely focus on the quantity of activities and on structured activities. Thus, the kind of activity and unstructured leisure activities are neglected. The aim of this study is to consider structured as well as unstructured extracurricular activity participation and to identify participation profiles and their influence on the students social behavior at school and academic achievement. Analyses are based on longitudinal questionnaire data from 5383 adolescents. Latent Class Analysis and path analysis were used to identify participation profiles and to investigate how these profiles affect social behavior at school and academic achievement. LCA led to a four class solution with good statistical characteristics and can be interpreted well. The four classes can be categorized as a culturally orientated group, a high activity group, the athletes and a less active group. The groups vary in terms of social and socio-economic composition. The first profile has a positive effect on academic achievement in 7th and that the first two groups show a better social behavior at school in 7th grade. These results underline the importance and the potential of participation in extracurricular activities at school as well as out-of school.

Is it a Double Edged Sword? Exploring the Reach of Project based Teaching and Learning

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Project Based teaching and Learning (PBL) has been a subject matter of research for a long time. It has been reported that PBL enhances student’s motivation and interest in learning. However, whether it is equally effective for developing an understanding of content has been debated. Another relatively less examined issue is the manner in which motivation of teachers get influenced when they engage in teaching through PBL. The present study examined these two issues. Three schools which were comparable with respect to background of children and facilities in school were identified. A measure to identify the PBL was developed and schools were classified as high, medium and low in the usage PBL. Children who had studied in three schools from grades I to IV were administered measure for measuring their self-concept, self-efficacy and level of competency in Mathematics and English language. Additionally teachers’ self-concept, self-efficacy and job satisfaction was also determined with three separate measures. Children in the high PBL school scored high on their self-concept, self-efficacy and scored much better in Mathematics and English. Teachers in the high PBL schools also scored higher as compared to low PBL schools, but differences were not as pronounced as in case of students. Implications of findings for classroom learning and motivation of teachers are discussed and directions for further research are highlighted.

Technology & knowledge: Teachers’ conceptions of subject-area practices and technology integration

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This paper explores teachers’ understanding of subject-area knowledge practices (e.g. curriculum, and pedagogy of a subject area) and technology integration, through the use of ‘social realist’ theory. Drawing on a major study of a technological initiative in secondary schools in New South Wales, Australia, this paper illustratively uses the concept of Specialization, from Legitimation Code Theory, to explore organizing principles underlying the subjects of Mathematics and English, in relation to teachers’ perceptions of technology in learning and teaching. Analysis suggests a ‘code clash’ with Mathematics and a ‘code match’ with English might help explain different patterns of integration of ICTs. The research is novel and innovative in its use of theory and combining the separate fields of educational technology and sociology of knowledge.

Teaching with games in secondary education in the Netherlands

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There is a growing interest in game-based learning. Research on how (commercial) games might be used in classroom settings is necessary to understand their potential as learning tools (Sandfort, 2006). However, insight into which games are seen as suitable by teachers in secondary education and how they are used within specific subject matter, is still as good as absent. The current research project is aimed at contributing to this understanding and has the following research question: ‘How do teachers use digital game-based learning to enhance the learning process of their students?’ 43 teachers using games in secondary education were interviewed on how they applied games in class, what educational goals they strive for, what they think students learn from it, whether students were motivated not only for the game but for the school subject as well, their pedagogy and their vision on game-based learning. Games being motivating is the most important reason for almost all teachers to use games. By using a motivating method they intent to enhance learning and differentiate their teaching. They find it hard to say what students exactly learned and some express a desire for more research comparing game-based learning with more traditional learning.

Do frequent, occasional and rare gamers differ when learning with serious games?

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Today’s students differ in the amount of time they spend playing entertainment-based video games. As past studies have suggested that frequent use of video and computer games may lead to the development of specific cognitive skills and dispositions, frequent gamers may have a better ability to learn from serious games. We tested this hypothesis in an experimental field trial with N=79 primary school students. While there are significant differences between frequent, occasional and rare gamers in self-reported video game skills, our results show no significant differences in knowledge gains when learning from a serious game. Additionally, we found no correlation between game playing abilities and knowledge gains. We conclude that the potential benefits of serious games are not solely or particularly applicable to frequent gamers.

How Physics Teachers Teach with Computer Simulations

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In this study we investigate the relation between how teachers teach with computer simulations, and how teaching with computer simulations is experienced by their students. We observed lessons given by 24 physics teachers in which they use computer simulations, and subsequently related data
originating from the observations of these lessons to the questionnaires filled in by the students. Our results show that teachers differ in the extent to which their teaching approach resembles the inquiry cycle, and the extent to which it is student-centered. For each teacher we calculated scores reflecting these teaching aspects: a score for Student-Centeredness and an Inquiry-Cycle-Score. The results of regression analyses reveal a positive relation between these scores and the extent to which students are convinced of that teaching with computer simulations contributes to their insight and motivation.

Teacher Enthusiasm and Expressiveness: Two Sides of One Coin?

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Teacher enthusiasm has been recognized as an important characteristic of good teachers and high-quality teaching. Its influence on, for example, students’ affective and motivational outcomes has been shown in previous studies. Yet, there is no overarching definition of enthusiasm; it has either been conceptualized as a strongly affective, intrinsic motivational characteristic of teachers or as teachers’ shown behaviors of expressiveness, but an integration of these two conceptualizations is still missing. Based on previous studies, we developed a model for dispositional teacher enthusiasm including positive affect and emotional expressivity and investigated whether this dispositional enthusiasm can be perceived by students and influences their enjoyment and intrinsic value. Thus, we conducted a questionnaire study with 80 subject teachers and their subject-classes, where teachers reported on their enjoyment of teaching and positive emotional expressivity. Students, in turn, reported on their perception of teacher enthusiasm and their outcomes. We could show that dispositional enthusiasm positively predicts students’ enjoyment and intrinsic value. This influence is mediated by students’ perceived teacher enthusiasm. In addition to a similar mediation already tested in a study by Frenzel and colleagues (2009), we could show that our dispositional enthusiasm is a better predictor for perceived enthusiasm than teacher enjoyment alone, as done by Frenzel et al. Thus, our model of teacher enthusiasm is one important step towards an integration of dispositional and behavioral enthusiasm as the dominant conceptualizations in literature so far.

Statistics anxiety, state anxiety during an examination, and academic performance

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Statistics anxiety describes the apprehension that occurs when an individual is exposed to statistics content, instructional situations, or evaluative contexts. As statistics-anxious students always experience anxiety when doing statistics, it describes an enduring, habitual type of anxiety. It was investigated to which degree statistics anxiety is related to state anxiety in the examination and to performance. Following the cognitive-interference approach, statistics-anxious individuals should divide their attention between examination-irrelevant thoughts such as worry and examination-relevant thoughts such as problem-solving. Anxiety consumes a portion of the processing capacity that would be needed for task performance in the examination. Two weeks prior to the examination, 284 students enrolled in a statistics course in psychology filled in a questionnaire on statistics anxiety and personal characteristics. Furthermore, students assessed their state anxiety immediately before and 25 minutes after the onset of the examination. Also, performance was recorded. Statistics anxiety received a crucial role in the structural equation model of the recorded variables. It was positively related to state anxiety before and during the exam. Via these assessments, statistics anxiety was negatively related to academic performance. Contrary to initial expectations, statistics anxiety also had a direct, positive relationship with performance. This result may be explained by students’ motivational goals in the specific educational setting. Students with high degrees of statistics anxiety should experience debilitating levels of anxiety in the examination but due to the high importance of the statistics examination for their studies they should be motivated to invest effort in the exam preparations.

**Psychological Stress and Strain of Students of Day Care Teaching**

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All relevant studies show that psychological stresses of day care teachers and related negative strains are far above average compared to many other occupational groups. Empirical research regarding psychological stresses is, however, limited to studies with persons actually working as day care teachers. Behavior and experience related health risks already existing during their training have not yet been considered. This study examines the magnitude of psychological stresses of students of day care teaching and analyses to what extent occupational and organizational structures of their training are being experienced as stress factors. 63 students answered both the AVEM-Questionnaire for Measuring Work-Related Behavior and Experience Patterns as well as an adapted version of the Short Questionnaire for Work Analysis. Respondents were in their first two years of training which mainly encompass theoretical aspects. The analysis of the AVEM-questionnaires reveals that a
significant percentage of students show harmful behavior and experience patterns. Even before working in day care, a large number of students feel over-challenged and experience a restricted satisfaction with life, reduced resilience, exhaustion and resignation. Compared to students and trainees of other courses, they show adversarial results in almost all dimensions of the AVEM-questionnaire. The differences are most apparent regarding the willingness to work until exhaustion and distancing ability. Regarding the Short Questionnaire it can be said that students with a risk pattern assess nearly all factors (especially quantitative work pressure and perception of receiving important information concerning the training) more negatively than do students with a health pattern.

Explaining variance in students’ Mental Well-being in England: background to educational experiences

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This paper will report on an analysis of a measure of Mental well-being: the Warwick-Edinburgh Mental well-being Scale (WEMWBS) collected from students in English secondary schools at the end of compulsory schooling (Year11, age 16). The aim of the analysis was to investigate the combined impact of a range of background demographics and family processes on Mental well-being, as well as potential educational influences. A number of hierarchical Linear regression models are presented, assessing the explanatory value of student, family, home learning, and neighbourhood influences as well as a range of family processes, life events and student activity information gained from student and parent questionnaire and interview data. Gender was found to significantly predict poorer
Mental well-being, as was living in a single parent household, but few other individual student, family, home learning, and neighbourhood influences were found to significantly predict Mental well-being. Indicators of family processes, such as quarrelling with parents, significant life events and out of school activities were found to be much better at predicting well-being, accounting for substantially more of the variance in Mental well-being scores. Students’ views of school, such as their subjective view of how positive relationships between teacher and students were also significantly predicted Mental well-being.

**Text comprehension, learning and thinking**

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The ability to acquire information from text determines the extent to which an individual can engage in independent, life-long learning. In this talk, the connections between deep comprehension and learning from text will be explored. Key findings from research focusing on the effects of a refutational text structure on learning and conceptual change illuminate these connections and will be critically reviewed. The text, however, also contributes to the formation and/or change of beliefs people have on a variety of issues. Yet little work has been devoted to examining whether and how comprehension of persuasive argumentative text relates to the critical evaluation of text-based arguments and, eventually, their persuasive impact. Toward this end, recent work on the comprehension and evaluation of argumentative text will be presented along with implications and suggestions for future research.

**Working memory in children with intellectual and developmental disabilities**

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The current talk considers the following question - is there evidence that children with particular intellectual and/or developmental disabilities tend to have particular working memory profiles across all four components of working memory? I will describe a series of research projects that have investigated working memory (including executive) performance in children with specific language impairment, general intellectual disabilities, Down syndrome and Williams syndrome. Taking into account our findings and the broader research literature, working memory profiles in these groups of children will be considered within the context of the impact they might have on future interventions. If we can use such profiles to understand working memory strengths and limitations in children with different types of intellectual and developmental disabilities, such work can potentially feed into more targeted and efficient interventions.

**Preparing Teachers for Responsible Teaching – Research on Teachers’ Professional Competence**

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The support of students’ sustainable learning through the creation of powerful learning environments is one of the most important challenges teachers have to master. In my presentation I will discuss how well teachers are equipped to achieve this goal and how they can be supported in developing the required competencies. After an overview of relevant research, I will present a model of teachers’ professional competence that identifies the key teacher characteristics that enable
responsible teaching. Moreover, the model states that these competence aspects are developed and formed via various learning opportunities throughout teachers’ professional lives. In my research group, we have tested these theoretical propositions in various studies ranging from large-scale teacher assessments to smaller intervention studies. I will first present findings that show how the different competence aspects affect teachers’ professional behavior. Second, I will present findings that delineate how professional competence forms and develops during teacher education and later professional development courses.

Analysis of a written composition scoring system based on the judgments of two independent raters

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The reliability of the scoring system plays a central role in the assessments of written composition. The use of multiple independent raters and the detailed analyses of the scoring system are common methods for improving reliability. The aim of the research presented was to examine the operation of one scoring system and to compare the severity of two raters involved. The analyses included both classical test theory and item response theory methods. Eighth grade Hungarian students’ compositions (N=429) were scored by two independent raters by a scoring system developed for this project, which comprises one holistic and nine analytic criteria. High reliability indices were found for both raters (Cronbach-a=.95). There are strong correlations between the scales (r=.85-.93, p The results highlight the problem of defining scales for written composition scoring systems. In the present case, the precise definition of the scales was not sufficient to guarantee consistent assessment, as the two raters still interpreted the scales differently. The findings indicate the need of the re-examination of the scoring system used and the necessity of providing professional training for the raters.

Effects of Technology-Enhanced Formative Assessment on Achievement in Primary Grammar

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Questions for Learning (QfL) is a technology-enhanced formative assessment technique in which pupils use wireless electronic handsets to work through questions at their own pace in a classroom setting. The handsets provide immediate formative feedback to pupils and teachers, allowing teachers to quickly identify and resolve learning problems or gaps. The evaluation of the use of QfL to teach grammar to Year 5 pupils in English primary schools produced positive outcomes for grammar after a relatively short implementation period of 12 weeks. In comparison to their matched counterparts in the control group, pupils in classes that used QfL with the recommended frequency gained more than their controls, with an experimental-control difference equivalent to an effect size of +0.27. There were no significant effects of the use of the self-paced devices for high achievers, compared to equally high achievers in the control group. All of the programme effect was due to positive effects for average achievers (ES=+0.30, p The findings suggest, therefore, that low-and average achieving pupils stand to gain more from the current QfL intervention in grammar than high achieving pupils. This seems to support research findings that feelings of self-esteem and self-efficacy, supported by pupils working at their own pace in a private learning environment, are

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important in determining the effectiveness of formative assessment feedback. The paper considers quality assurance in assessment in terms of teachers’ responsible use of formative assessment information provided through the affordances of QfL technology to promote sustainable pupil learning.

**Linking Cross-sectional And Longitudinal Perspectives On Instructional Sensitivity**

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Research on educational effectiveness as well as policy-makers regularly rely on student performance data to evaluate schools or teaching (Creemers & Kyriakides, 2008). However, the implicit assumption that outcome measures are sensitive to instruction is scarcely questioned. This refers to the validity concept of instructional sensitivity. There is a consensus that instructional sensitivity is defined as the psychometric property of tests or items to react sensitive to instruction (Polikoff, 2010). However, there is no generally accepted operationalisation. The present study combines two existing yet independent statistical approaches, assuming that integrating their unique perspectives allows for comprehensive judgement of test items’ instructional sensitivity. We integrate a) the Pretest-Posttest Difference Index (PPDI; Cox & Vargas, 1966) and b) multilevel differential item functioning (DIF; Holland & Wainer, 1993) conditional on educational settings in a combined longitudinal multilevel-DIF model and exemplarily apply our approach to data from a German large-scale assessment. Analyses focused on a 34 items language-awareness test administered at the beginning and the end of grade level nine. Data comprised responses from 10,965 students in 427 classes. For each item, we estimated PPDI, posttest multilevel-DIF and our longitudinal multilevel-DIF model. As empirical results indicate, when using only either classical PPDI or posttest multilevel-DIF, results on instructional sensitivity may be partially incomplete. A combination of both provides comprehensive statistical information on items’ ability to make learning visible, allowing the distinction of global and differential sensitivity.

**Predictive Validity of Online-SelfAssessments regarding Academic Success in Mechanical Engineering**

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Academic success is a politically and economically important factor. This specifically holds true for studies in engineering. As few of the studies that address factors of academic achievement are truly longitudinal, this paper analyses the predictive validity of data of a domain-based Online SelfAssessment (OSA). By means of the OSA instrument, universities try to initiate self-selection processes of prospective students. Thus, OSA addresses senior high school students and graduates who can voluntarily participate. In this study, academic success and development of these prospective students are predicted by means of their responses given in a domain-based OSA before entering university. Domain-based cognitive as well as motivational and interest scales are delivered to students considering studying mechanical engineering. The scales show differential validity in two different cohorts (N2008=987, N2009=935). The OSA data plus high school grade point average explain up to 40% of the variance of academic success within the first two years at university. Without high school grade point average, the OSA scales explained up to 24% of students’ success, confirming the predictive validity of this tool. Cognitive scales are the strongest predictors. Nevertheless, incremental contribution of interest and motivation is substantial. Thus, OSA tools provide an economical supplement to traditional career counselling, especially in a time with limited resources at universities. Furthermore, OSA can be considered one among other means of establishing and managing relationships with prospective students.

Data Driven Decision Making and the Impact of the Principal – Results of the EviS-Study

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The current high-stakes accountability environment in many European countries has created strong initiatives for teachers to collect and use data in order to improve instructional decisions and school development. Recent qualitative case studies have shown that the principal plays a key role in this context. According to these studies there are various strategies for the principal to promote data use among teachers. This presentation examines both the effectiveness of strategies that have been investigated in these qualitative case studies already and strategies that played a key role in Germany’s reform agenda (such as supporting teachers to participate in decisions, supporting cooperation among teachers, supporting communication among teachers and transformational leadership). This presentation is based on the findings of a large quantitative study. On the one hand it is found that the impact of the strategies differs widely. On the other hand it is found that the mix of certain strategies makes the difference regarding the effectiveness of promoting data use.

A comprehensive perspective to assessment innovations

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Teachers’ assessment practices are influenced by various underlying variables like for example conceptions or self-efficacy beliefs. These strongly influence the uptake of assessment innovations. However, relations between various variables are often studied in isolation, outside of a concrete
assessment (innovation) context or in relation to written types of assessment. This contribution shows the alignment of various variables related to teachers’ assessment practices in a concrete assessment innovation context of competence-based performance assessments. Hierarchical followed by k-means cluster analysis conducted on specific, contextualised questionnaire data of 409 prevocational teachers, identifies two clusters of teachers: sceptics and proponents. Both clusters show strong alignment between various variables relating to either little or more use of the new CBA. Results show that teachers’ understanding of the specific assessment innovation (i.e., understanding competencies) as well as having experienced competence-based learning themselves relates to their feeling of self-efficacy to use competencies in teaching, learning and assessment, their application of assessment-for-learning activities, and actual use of the new CBA, related new assessment methods, and aligned complex, realistic learning tasks. While, surprisingly, the degree of experience with the new assessment technique did not differentiate the clusters. As such, this study suggests that assessment innovations should take a comprehensive perspective towards teacher professional learning, starting with challenging teachers’ understanding of the underlying principles of the assessment innovation as a start for fostering alignment and uptake of the new assessment.

Feedback about Students’ Subtraction Errors via the Empty Number Line: Possibilities and Challenges

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In this study we used the Evidence Centred Design (ECD) framework to design a diagnostic test for primary school mathematics. In the design of diagnostic tests it is important to meet teachers’ assessment needs, because eventually we want them to be able to use the data to inform their practice. The aim of the current study is to investigate in what way the empty number line (ENL) can provide teachers with feedback about student’s errors in subtraction problems up to 100. Besides giving teachers feedback about students’ solving process, we were interested in the possibilities to diagnose whether a student benefits from the ENL. We collected 600 solutions on the ENL of 30 grade 3 students. To evaluate which students benefited from the ENL, we formulated constrained hypotheses and used the Bayes Factor (BF) to evaluate our hypotheses. In this contribution we will discuss the possibilities and challenges the use of the ENL in diagnostic testing. Also, we expect that our results can contribute scientific knowledge about teaching for deep understanding in primary school mathematics.

Developing mathematical competence: from the intended to the enacted curriculum

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In this presentation a collaboration between three organizations is presented. The Swedish School Inspectorate, the National Center for Mathematics Education and a university research center. The study investigates the ways in which teachers offer students opportunities to develop mathematical competencies. Competency goals exist in the curricula of many countries, but how they influence classroom teaching is unclear and not previously investigated in Sweden. Despite the presence of goals of this type in Curricula around the world, there’s a lack of precise research frame works functional as tools for conducting research. Such a research framework is thus developed, presented
and used in this study. The study seeks answers to the following; how do teachers interpret these goals, and what competency related activities they offer students? Data were gathered through interviews, classroom observations and online surveys with 200 teachers from compulsory schools to upper secondary. In contrast to most studies of this size, large-scale qualitative analyses were conducted on most of the data. For all studied age groups (school years 3-10), procedural management is the most common competency activity, particularly in working on textbook based tasks. The study finds few indications that teachers interpret the national curriculum in terms of competencies, i.e., regard the curriculum as containing goals for student learning and guides for classroom activities.

**Methodological challenges in the assessment of collaborative problem solving**

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The urgent necessity of developing collaborative problem solving skill in educational context is commonly accepted. However its assessment implies serious difficulty. To register any development of collaborative problem solving we have to first become able to develop an effective, reliable method for its measurement. The aim of this paper is to collect and to discuss the problematic issues of collaborative problem solving assessment. We present the difficulty of finding a suitable method for covering both social and cognitive components of collaborative problem solving in its measurement; we describe the challenges of assessing collaboration skills on individual level; we take a close look at the issue of reliability and in addition computer agent application as a potential solution; we discuss the arising problems of computerizing the assessment of social performance as a part of collaborative problem solving skill; finally we briefly present our suggested model for collaborative problem solving measurement.

**Performance-based assessment for diagnosing beginners: The viability of involving peer-raters**

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This study implemented a performance-based assessment, Objective Structured Competence Examination (OCSE), to first-year master students (N = 27) in Learning Sciences. The aim of this study was to investigate whether senior student raters are reliable when compared to professional-raters. The assessment was implemented in two stations with (a) different kinds of tasks, (b) using two rating methods. Station1 consisted of a statistics methodology task where the expected performances were spelled out in terms of distinctive behaviors. Station2 consisted of a group discussion on basic instructional approaches and was designed to be more comprehensive and open to behavioral variability. Both stations used a checklist and global-rating to assess the students’ performance. One senior student- and one professional-rater (for station2, an external professional-rater) assessed each student. To determine rating accuracy, Intra-class correlation (ICC) and Pearson correlation coefficients were used. Results revealed that the inter-rater consistency in station1 was
high for both checklist, ICC = 0.94, p p r(25) = .24, n.s., and moderate for global-rating, r(25) = .61, p = .001. The results reveal that senior students may be considered as reliable raters irrespective whether checklists or global-ratings are used. However, for more comprehensive tasks an extensive training of student raters is required.

Beyond formative and summative: sustaining learning through technology enhanced assessment

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The world is changing at a rapid pace and the necessary knowledge, skills and practices are also constantly evolving and requiring adaptation. Whilst pedagogical thinking and curricular has sought to address such challenges, it is argued that assessment practices lag behind and are preoccupied with traditional methods, narrow achievements and qualifications. Technology enhanced assessment or TEA is argued, from a sociocultural perspective, to have potential to help address some of these challenges and make assessment more meaningful for learners. The paper reports on an on-going study investigating the potential of TEA to support innovative forms of assessment practice and how far these have been transformational for students, teachers and organisations. Findings from an extensive literature review are reported, focusing in particular on the blurring of boundaries between formative and summative assessment in recent studies of TEA. The paper argues that such possibilities can increase the sustainability of learning by making assessment more integrated and meaningful and can take place over longer time periods. The paper discusses the social, cultural, economic and political influences that hindered some of the studies in our review from realising their full potential and finally, the role of TEA in rethinking assessment as a more sustainable practice is considered.

The level of degree programmes in higher education: a cross-national comparison

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This paper focuses on the valid and reliable evaluation of degree programmes in higher education in order to make them cross-nationally comparable. This problem became crucial with the Bologna Agreement in 1999 when European Ministers of Education agreed to implement the bachelor and master structure in their countries. This problem is theoretically relevant because of a theory on the
concept of ‘the level of degree programmes’. The concept is elaborated in relation to educational theories. It is established that mental activities of students in higher education consist of cognitive, affective and regulative activities. These activities are specified in the level concept with Disciplinary Thinking, and Professional Attitude. This study has been carried out with empirical data from five bachelor degree programmes from five European countries. Participants of the study were several members of the degrees and their alumni. The Evaluating Level Evaluator (ELE), based on the Design Research Methodology, is the used method. In the ELE the level concept is operationalised and measured. The method for delivering evidence for construct validity is Principal Component Analysis with Varimax rotation. In this study the conceptualised themes are measured as existing constructs with the PCA with components explaining good results. The degree programmes from the five countries have a profile consisting of four themes and twenty-four valid learning outcomes. They can demonstrate to what degree they meet the cross-national degree programme level and they are able now to find the best characteristic activities to realise the valid learning outcomes.

Peer-Assisted Learning Tasks in Science Education in Primary School

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Peer-assisted Learning (PAL) can engage students in a constructive discourse, which is known to foster student learning. In science education, exchanging peer explanations is valuable for reconstructing a naïve understanding to a more scientific conception. Task conditions influence the quality of discourse and will, consequently, affect learning outcomes. However, research on the impact of task conditions on peer explanations in primary school science education is scarce. The present study investigates the effects of two task conditions on the amount of content-related peer-explanations and on the levels of students’ conceptual understanding. Interactions of 20 pairs of students attending 10 third-grade primary school science classes were audio-recorded and transcribed during PAL. All students worked on two consecutive science tasks, an experiment task and a worksheet task. We developed a coding system to assess students’ discourse structure, distinguishing three main categories: statements with the sub-category of explanations, questions, and feedback. 3,633 utterances of the transcripts were coded (inter-rater reliability: $\kappa=.78$). Results show a similar discourse structure within the two task conditions, but students generated more explanations on content (a sub-category of statements) during the experiment task ($t=3.47$, p

From Molecules to Mammals: Domain Specificity in Reasoning about Emergent Systems

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Understanding emergent phenomena, which play a role in a variety of topics such as ant foraging behavior and traffic jams, has proven challenging for students. Prior research on how students perceive or explain emergent systems has tended to focus on a single phenomenon, such as the circulatory system (see for example, Chi, 2005). The purpose of the present study was to explore whether domain differences due to perceived agency of the organism and type of emergent phenomena were salient to learners. Participants (314 university students) observed 8 simulations that varied these features. Significant differences were found for participants’ ratings of characteristics of agents in each emergent system. Our results show that even as researchers treat emergent systems involving distinct agents (geese, bacteria, molecules) as equivalent, students do not. Instructional interventions designed to teach students about emergent systems frequently focus on one or a small group of phenomena, hoping that knowledge will transfer. Our findings suggest that such transfer is unlikely to occur, unless systems are of the same ‘sort,’ as perceived by the students. (174 words)

Trainee Teachers’ Content and Pedagogical Content Knowledge: Evidence from Economics/Business Studies

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Previous research supports the notion that teachers’ Pedagogical Content Knowledge (PCK) is constrained by their Content Knowledge (CK). In this study we set out to examine this result from the stand point of Variation Theory/Phenomenography, defining CK as teachers’ conceptions of a phenomenon and PCK as their awareness of differences between conceptions. Evidence of trainee teacher conceptions of price and their knowledge of variation in students’ conceptions of price is gathered from 113 Economics and Business Studies pre-service teachers in England (49% of the national cohort) and compared. In addition, categories of description are developed in relation to
trainees’ general conceptions of differences between student conceptions and these also form a basis for comparison. Overall our analysis from Economics seems to confirm the results of previous research in mathematics. We conclude that framing PCK and CK in terms of Variation Theory/Phenomenography offers theoretical unity and clarity to an understanding of both concepts, as well as a practical way of measuring both.

Secondary school students’ conceptions of complex economic phenomena

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Given their importance for supporting sustainable learning, the investigation of prior conceptions has a longstanding tradition especially in science learning, whereas efforts concerning students’ conceptions of economic issues cannot be found in the same intensity and scope. The research to be presented here aims to contribute to filling this gap by exploring adolescents’ prior conceptions of complex economic phenomena. More specifically, a qualitative research study was conducted that is focused on the issue of how secondary school students conceive and experience the current economic and financial crisis. The study, which is informed by two complementary theoretical approaches (i.e. cognitive psychology and phenomenography) encompasses semi-structured interviews with 56 secondary school students (average age: 16 years; 58 % female). Among other results, four different conceptions (‘Denial’, ‘Magical Thinking’, ‘Optimism’ and ‘Realism’) could be reconstructed which vary with respect to the level of students’ awareness of three different facets of the crisis. The obtained data confirm that students have severe difficulties to adequately understand complex economic phenomena and that they very often do not realize the influence that those phenomena do exert in their daily lives. The study furthermore amplifies these findings by providing more ample accounts of secondary school students’ mental spaces concerning knotty economic matters.

The effect of differences in SFON and mathematics anxiety on children’s numerical processing

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‘Spontaneous Focusing on Numerosity’ (SFON), i.e. one’s tendency to focus on the numerical aspects of their environment, and mathematics anxiety (MA) are two factors which may play an important role in children’s numerical development. To investigate how these factors interact we gave 8-9 year old children a mathematics anxiety questionnaire, a picture description task designed to assess SFON, and a numerical comparison task designed to assess nonsymbolic and symbolic numerical processing. We found that both SFON and MA had a significant effect on children’s numerical magnitude processing. Children who focused on numerosity in the picture task (high SFON children) showed an advantage on the symbolic comparison task over their low SFON peers. With regard to MA, children who were not anxious about mathematics performed better on both the nonsymbolic and symbolic comparison tasks than their highly anxious peers. Interestingly, there was no
relationship between SFON tendency and MA which suggests that they are two independent constructs, both of which warrant further investigation given their significant effects on children’s numerical magnitude processing. If we can uncover the origins of SFON and MA then this may open up new ways of identifying and helping those children at risk for developing mathematical difficulties.

**The role of differentially guided instruction on learners’ discussions during problem-based learning**

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Problem-based learning (PBL) environments have proved to be effective to foster complex skills, such as mathematical argumentation skills. However, there remains the question of how much guidance is most beneficial to acquire such skills. We differentiate levels of guidance with respect to the availability of solution steps on three different content levels (Renkl, Hilbert, & Schworm, 2009). Heuristic worked examples provide information on three content levels with a special focus on the strategy level and learning environments with no information on any content level will be called problem solving. While Kirschner, Paas, Kirschner, and Janssen (2011) showed that problem solving in collaborative settings was more effective than studying worked examples, results of a study by Kollar et al. (2012) indicated that for high achieving learners heuristic worked examples are superior to problem solving in PBL environments with respect to learning outcomes. To get a deeper insight we analyzed discussions during three treatment sessions of N = 119 students working in dyads according to the number of statements on different content levels. Our analyses indicate that in the heuristic worked example condition students with higher prior achievement used the learning materials adequately and discussed more on the strategy level than students with lower prior achievement, but not during problem solving. The results show that besides analyzing how the intended processes during learning are realized it is necessary to consider different levels of students’ prior achievement to explain the effectiveness of heuristic worked examples for the facilitation of mathematical argumentation skills.

**Math anxiety and gender – how girls and boys differ in fourth grade**
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Math anxiety is a well-studied construct within school-related anxieties. Recent studies suggest a multi-dimensional structure of elementary school pupil’s math anxiety. It remains unclear whether these dimensions are applicable to both, girls and boys. The present study aims to analyse gender differences in a math anxiety questionnaire. Results indicate that a multi-dimensional view of math anxiety is equally applicable to both genders. However, girls report higher math anxiety with tasks related to school (math tests, math teacher), but not with the everyday use of mathematics. In conclusion we discuss how teaching behaviour may contribute to the development of math anxiety.

Early years’ prospective teachers’ MKT on fractions when interpreting students’ productions

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Rational numbers, in its fractional representation (we will call them only fractions), are one of the topics in which students’ reveal great difficulties, despite being one in which there is a vast amount of research. Students’ limited understanding might be related with how their teachers understand and interpret fractions. Although there is a generalized agreement on the importance of teachers’ knowledge on/for students’ learning, most research on fractions focus on students, leaving aside the teachers and their knowledge on the topic. Thus, teachers’ training has in certain respects been left behind. In our work we perceive teachers’ knowledge in the sense of the Mathematical Knowledge for Teaching (MKT), and we aim, mainly at accessing, understanding and developing such knowledge both in prospective and practicing teachers. One dimension of teachers’ knowledge concerns teachers’ task of interpreting and giving sense to students’ productions. We have developed, adapted (to the context) and implemented a set of tasks (complemented with interviews) in Italy, Norway and Portugal, aimed at accessing and discussing prospective teachers’ knowledge when interpreting and giving sense to real students’ productions. The findings show that (most) prospective teachers interpret students’ answers having their own solution as a reference and, in such they reveal the lack of important critical features in their own knowledge. It is also evident that this kind of approach has the potential to develop teachers’ MKT as well as concerning the role and specificities of the tasks in teachers’ training for promoting such knowledge.

Learning to Observe Scientifically – Measurement and Promotion of Biological Observation Competency

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Abstract In recent years observation competency (OC) has become part of pre- and elementary school curricula in many countries. As children of 4 years and upwards are able to generate hypotheses independently, the training of OC becomes possible during preschool education. To be able to provide development-adequate individual fostering of OC, an assessment of each child’s competency is firstly necessary. Therefore, based on recent literature a competency model was developed and empirically evaluated within different age groups (N = 110; age 4-29 years). In addition, data on linguistic skill, domain-specific interest and previous knowledge were collected to analyse coherences between these skills and OC. Based upon this model guided play activities to foster OC in preschool were developed and empirically evaluated. In the competency model three of five supposed dimensions (Describing, Scientific reasoning, Interpreting) were empirically confirmed as independent and are ordered on three skill levels (Incidental Observation, Unsystematic Observation, Systematic Observation). It could be shown that previous knowledge has a high impact on OC ($\lambda$ = .66, $p$, whereas the influence of domain-specific interest is nonexistent ($\lambda$ = -.17, $p$. Language skills were shown to have a weak influence ($\lambda$ = .28, $p$. Based upon the empirically evaluated model guided play activities that seem to be suitable to promote OC in preschool were developed and evaluated by the help of preschool teachers.

The Influence of a Science Education M. Ed. Program on Teachers’ Professional Development

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We present the ongoing results of a study, carried out in the framework of the Science Education M. Ed. Program in Oranim College. The purpose of the study is to analyze if, and how, the Program influences the student teachers’ methods and ways of teaching towards a constructivist approach. Twelve students participate in the study (8 women and 4 men; 5 biology, 5 mathematics and 2 physics teachers; 7 Hebrew and 5 Arab speaking). In their first semester they were all interviewed, asking them mainly what they know about their students’ prior knowledge and to which extent they encourage students’ active learning. Afterwards the researchers observed students in their classrooms and rated their teaching according to the Reformed Teaching Observation Protocol, which was designed to evaluate inquiry based and student centered mathematics and science classrooms. Students got a low rating of 37.3 out of 100 with a SD of 11.3, indicating that most of them were teacher-centered. From the teachers’ interviews and the RTOP scores, teachers’ instructional styles as reflected in their own perceptions were closely consistent with their actual practices. In second year, they were interviewed and observed once again. In the interviews they indicated which courses influenced them on their teaching, and how, but they also talked about factors that constrain change. The students’ RTOP marks increased notably up to 52.0 with a SD of...
15.2, with five students getting a mark greater than 50, that is, a considerable presence of student-centered teaching.

**Learning from Questions During a Museum Visit**

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This study shows that providing students with adjunct questions during a museum visit, benefits learning of the information covered by those adjunct questions. However, such exercise does not benefit learning beyond those questions. Teachers should be aware of the discrepancy between the unique aim of museum field trips (i.e., free-choice learning that enriches classroom learning) and their need to fulfill the educational standards.

**Interference as a Tool to Achieve Conceptual Understanding of Chemistry**

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Previous research on Multiple External Representations (MER) has found that sequencing representations can increase deep conceptual understanding if interference between internal and external representations takes place. We tested sequencing by presenting scientific and abstract representations to 133 learners with low prior knowledge of the represented domain. Results give insight into three separate mechanisms on learning with MER. (1) A memory (number of ideas reproduced) and an (2) accuracy (correctness of these ideas) effect occur when two representations are presented in a sequence and an accuracy and a (3) redundancy (number of redundant ideas remembered) effect occurs when three representations are presented in a sequence.

**A provisional standardization procedure of the computerized Early Numeracy Test-Revised in Spain**

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The Early Numeracy Test-revised (ENT-r) was developed and a provisional standardization procedure was carried out in order to adapt the new ENT-r. This new version of the ENT-r was translated into Spanish and adapted from paper-and-pencil process to a computerized version with the aim to be available on line for schools. In this paper we present the adapted version and a provisional standardization procedure with Spanish children. For this provisional pilot study a sample of 139, 4-7 year old, children were individually assessed. 70 were girls (50.3%) and 69 boys (49.6%). Children were chosen from 3 public schools in a middle class area and tested by researchers with a wide experience assessing young children. Three different provisional statistical analyses were completed with ENT-r data. First, a descriptive data analysis, then a transversal calculation comparison the scores cross aged, and finally a reliability study was achieved. Preliminary results suggested that the ENT-r is reliable and items are discriminative for prerequisite and counting tasks.

Does schooling have an impact on short-term memory?

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Short-term memory (STM) capacity in the context of academic attainment is of great importance and studied extensively although experimental interventions to increase STM or working memory have yet to produce long-term gains. But is it possible that schooling can have a positive effect on such processes? The analysis of a large longitudinal dataset indicated clear gains in STM capacity during the first year of schooling, which was predictive, at the pupil level, of attainment in national tests six years later. Schools varied somewhat in their apparent impact on STM capacity but this did not translate into differential gains in the national tests at the school level. Possible explanations for the findings are discussed and it is argued that a sufficiently strong prima facie case has been made for the impact of schooling on STM to warrant further investigation.

More Than Reading Literacy? The Competence of Text Picture Integration

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Even so texts with instructional graphics are often used at school, the integrative comprehension of textual and pictorial information is not systematically taught. To investigate students’ skills to integrate information from texts and pictures a competence model was developed. The evaluation of this theoretical model involved a pilot and a main study. Whereas the results of the pilot study were used to compile grade specific test booklets, the main study focused on verifying the theoretical assumptions. Due to its hierarchical nature the data was analyzed with a multilevel path model comparing the competence of text picture integration with reading literacy. The results of this analysis can be interpreted as an indication that the competence to integrate picture and text information includes more than just text-based reading literacy.

Impacts of early and delayed school enrolment on academic skills in primary school

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Retention and class repetition have been the subject of considerable interest in the past years internationally. In Germany in particular, early and delayed school enrolments and their long-run effects are highly controversial. Embedded in the longitudinal study BiKS 3-10 we use parent and teacher ratings as well as competence tests to analyse the impact of not on time school enrollment on the development of language and mathematical skills in first and second grade. Propensity score matching was applied to control for selectivity before school entry. Comparisons at the end of first and second grade reveal that early school enrolment seems to be a risk, especially for language skills and teacher ratings of mathematical achievement. However, the effects decrease from first to second grade. Contrary to these negative effects increasing advantages in math and language skills were found for delayed children compared to those with comparable preconditions who started school according to the cut off-date.

Psychological needs satisfaction and pressure in the teaching profession

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Based on the findings of Deci and Ryan a noticeable amount of studies point out the advantages of autonomy supportive teaching. But why is it so hard for teachers to use these strategies in class? This is one of the few research projects concentrating on the requirements teachers need to provide autonomy supportive settings in class. An empirical survey with 732 secondary school teachers from Austria focused on the basic psychological needs satisfaction of teachers, their feeling under pressure in their job as well as their self-efficacy beliefs, their proactive attitude and their team orientation. Various sources for pressure in the teaching profession could be identified. Structural equation modeling was used to analyze the data and the results indicate a reciprocal relation between psychological needs satisfaction and feeling under pressure. Needs satisfaction was related to self-efficacy. Self-efficacy and pressure had an impact on proactive attitude, which in turn was related to team orientation. The results provide suggestions for policy makers and teacher training in order to improve psychological needs satisfaction and to reduce pressure in teaching.

Shaping identities and futures through language learning

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The study presented here, examines identity related categorizations in relation to language at large and literacy in particular, through the development of a tailored education in Swedish language for adult immigrants, Swedish for immigrants (Sfi). Taking a sociohistorical and sociocultural point of departure, learning a new language such as Swedish includes the ‘making’ of identity in a specific context. The guiding questions in the study are; What aims vis-à-vis language (including
literacy) can be traced in this education across time? What conceptualizations dominate vis-
vis the target group of the education across time? The analysis of policy material
(primarily curricula and syllabi) from a period encompassing over 50 years, presented in the study,
highlights both the opportunities enabled but also the restraints that emerge through the language,
including literacy education for newcomers in Swedish society. The languaging including literacy
experiences that certain categories of students are exposed to and are expected to become
competent in during the course of the education, thus makes specific identity positions and
membership in certain communities of practices more available (and possible) as compared to
others.

**Here Today, Gone Tomorrow: Helping the Non-Completing Graduate Student Avoid the Schubert Syndrome**

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This paper describes a research study that was conducted among master’s degree candidates in an
educational technology program at a four-year comprehensive university in northeastern United
States. The study concerned the problem of student non-completion in a 3-credit master’s project
course, which is the capstone course in the program and a final requirement for graduation. The
research was conducted between the fall of 2009 and spring 2012. The research approach was a
qualitative, action research approach, with student observation, verbal and written feedback, and
submitted master's projects used as data for analysis. The research question was as follows: ‘How
might the completion rate of student master's projects in an educational technology graduate
program be increased?’ The sample used was a convenience sample, and included 82 graduate
master’s students in six graduate classes (i.e., one class per semester) of the master’s project course
EDC 690. The outcomes of the study are promising. Of the 82 students who participated in the study,
only one student did not complete their master’s project in the allocated one-semester period (this
student did, however, complete their project the following semester). At the completion of each
course, many students commented that the traditional, face-to-face course approach taken had been
very helpful to them; had provided them with valuable instructor and peer support; and had been
instrumental in the successful completion of their projects in a timely fashion.

**The role of teachers’ cognitive support in enhancing Hong Kong six-graders’ autonomous motivation**

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This study aimed to examine the relationships between Hong Kong six-graders’ autonomous motivation in reading lessons, students’ views on cooperative learning and teachers’ instructional practices, their use of reading strategies, their reading comprehension, and teachers’ cognitive support. The participants were 645 Grade 6 Hong Kong students from nine Hong Kong primary schools. Reading lessons of 19 Hong Kong Grade 6 Chinese teachers were analyzed according to the six dimensions of the Motivating Instructional Context Inventory. Students’ subjective reports on their perspectives on cooperative learning and instructional practices, their awareness of using reading strategies, and their reading comprehension scores were also collected. Hierarchical linear modeling showed that students tended to report higher autonomous motivation when they reported higher scores of perspectives on cooperative learning and instructional practices, and more frequent use of reading strategies, and when their teachers provided more cognitive support to motivate them to read. However, students’
autonomous motivation and teachers’ cognitive support did not contribute to students’ reading comprehension. Implications for how to enhance students’ autonomous motivation and reading comprehension will be discussed.

Attitudes towards mathematics: Effects of individual, motivational and social support factors

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This paper aims to understand how certain different but interrelated variables such as background, motivation and social support could lead to an explanation of student attitudes towards math and to an understanding of the defining characteristics of these attitudes in the school environment. Participants consisted of 1719 Portuguese students, from fifth- to twelfth- grade. The study utilizes an adaptation of the ‘Intrinsic Motivation Inventory’ assessing main determinants of intrinsic motivation. One section of the questionnaire - ‘In my Math Class’, also assesses student perceptions of teacher and peer support as well as student attitudes. The results revealed that, in general, students held positive attitudes towards mathematics and also highlighted the main effects of grade and math achievement on these attitudes. No gender effect was identified although the girls showed a continuous decline in attitudes the further they progressed in school. A hierarchical analysis using structural equation modeling showed that motivation related variables are the main predictors of attitudes towards mathematics and that teachers and the social support of peers is also highly significant in understanding these attitudes.

Fostering Interest in Learning More about Climate Change Through A Computer Simulation Game

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The purpose of the present study was to investigate student perceptions of a computer simulation game designed to increase understanding and interest in learning more about climate change. Sixty middle school students who played ‘Losing the Lake’ participated in this study. Results indicate that
students enjoyed the game and that enjoyment accounted for variance in their interest for learning more about climate change. Results also indicate that students especially enjoyed learning new information and fun, interactive game features the most. After interacting with the game, students wanted to learn more about such topics as water supply/availability, water conservation, and climate change related issues. This study indicates that computer simulation games developed to teach about complex systems and using ‘water’ as a central concept--can be effective tools for increasing understanding and interest in climate change.

**Does perceived teachers’ diagnostic competence moderate effects in the I/E model?**

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The Internal/External (I/E) Frame of Reference Model predicts self-concept formation using social and dimensional comparisons based on achievement in different academic domains. There is a large body of research in support of the postulated positive effects of achievement on self-concepts within a domain and the negative effects of achievement on cross-domain self-concepts. To go beyond previous research, this study aims at elaborating these comparison processes by adding teachers’ diagnostic competence concerning students’ achievement as a moderator to the I/E model. Drawing on a sample of N = 1045 secondary school students, structural equation modeling was conducted including interactions between mathematics and verbal grades and teachers’ domain-specific diagnostic competences. Predictions from the I/E model were supported. Moreover, teachers’ diagnostic competence moderated dimensional comparisons but not social comparisons: Achievement was clearly related to the cross-domain self-concept when the teacher’s diagnostic competence in this domain was perceived as low; this influence was attenuated with higher diagnostic competence. It seems thus, that students tend less to additionally include sources other than their peers’ grades, such as dimensional comparison, when the teachers’ diagnostic competence is perceived to be high. These results serve to further deepen our knowledge about self-concept formation.

**Children’s self-evaluation bias of school competence and mechanisms of social comparison**

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The first goal of this study was to trace the developmental trajectories of self-evaluation bias of school competence over a five-year period beginning when the children were in Grade 5 of primary school. The second goal was to examine whether social comparison mechanisms (upward and downward identification and upward and downward contrast) measured at the first year of the study were linked with belonging to these trajectories. 602 students whose parents gave a written consent volunteered to participate. The results allowed identifying four trajectories of changes in the self-evaluation bias of school competence. They show that upward identification and downward contrast were unrelated with trajectory membership. Compared to students whose trajectory’ bias was always highly positive, downward identification increased the possibility of belonging to the trajectory where students’ bias was generally realistic, to the trajectory where students’ bias moved from negative to positive, and even more so to the trajectory where students’ bias was already negative at the outset of the study and became more negative over time. Compared to a realistic or optimistic trajectory, upward contrast increased the probability of belonging to the progressive or pessimistic trajectory. The discussion will focus on the processes by which the social comparison mechanisms led to develop self-evaluation biases of school competence. Under-evaluating their competence engenders high costs for students’ functioning and scholastic achievement. It puts in jeopardy their success and threatens their scholastic trajectory both in the short and long terms, as well as interfering with a balanced and satisfying personal development.

Literacy learning patterns over summer and the influence of families’ writing and reading practices

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The ‘summer learning effect’ (SLE) is known as a stall or drop in achievement over the summer break in schools which serve poor or ‘minority’ communities. There has been little research in Germany on the effect in general and only limited research internationally on the SLE in writing or on the writing and reading practices at home that might be associated with influencing the SLE. This paper describes the extent and nature of the SLE in writing and reading in two primary schools situated in a low and a high socioeconomic status community in Germany. It is argued that the SLE is not a problem solely facing low socioeconomic status communities as this study revealed variability in learning patterns over summer at both, low and high socioeconomic status, schools. Students from both schools gained, stalled or dropped in their achievement levels over summer. Interviews with sixteen students and their parents were carried out to gain an in-depth understanding of these patterns and to identify writing and reading practices of students and their families over summer that have influenced the effect. The analysis further drew on achievement data (n = 78), literacy logbooks (n = 49), and parents’ questionnaires (n = 53). By adding to the understanding of the summer learning effect in different communities and different contexts, the findings allow for contextualisation and provide a basis for thinking about how learning and development of writing and reading can be sustained outside of the classroom.
Hong Kong parents’ conceptions of learning in a parent education program

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Understanding the conceptions of learning from the learners’ perspective is useful to educators and to providers of educational programs. Numerous studies have been conducted on this subject and most refer to Marton et al’s (1993) six conceptions of learning: (a.) increasing one’s knowledge, (b.) memorizing and reproducing, (c.) applying, (d.) understanding (e.) seeing something in a different way, (f.) changing as a person. In this study, the focus is on the conceptions of learning of parents of adolescents. In recent years, there is an increasing number of parenting education programs Hong Kong schools. However, no standards exist nor are there bases for curriculum development and program design. By understanding the parents’ conceptions of learning, this study attempts to provide a theoretical basis for the design of parent education programs in schools. Phenomenography (Marton, 1981, 1986) was employed as the research method. Semi-structured interviews were conducted with 19 parents. Transcripts of the interviews were analyzed following the phenomenographic convention. Six categories of description regarding parents’ conceptions of learning have emerged: Learning as (a.) recalling experiences, (b.) acquiring problem solving skills, (c.) applying the problem solving skills, (d.) recognizing a new parent-child relationship, (e.) gaining another understanding of parenthood, and (f.) changing parenting attitude and practice. A hierarchy of relationships and inclusiveness are found among the categories.

Home resources as a mediator of effects of parental support and motivation on reading performance

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In the research literature, parental early reading support, parent’s own reading motivation, and provision of home reading resources are three important variables used to explain children’s reading performance. Based on a conceptual model guiding conduct of enquiry, the causal influence relationships of the three variable constructs after adjusting for the prior effects of ESCS (Economic, Social and Cultural Status) and gender of student are analyzed using structural equation modeling. It was found that how home reading resources serve as a mediator of the effects of parental early support and motivation on reading performance are drastically different across the three top-performing Asian-Pacific economies (i.e. Korea, Hong Kong, and New Zealand) participating in PISA 2009. For Korea, the effect of parental early reading support on reading performance is mediated in total by provision of home reading resources, whereas for Hong Kong it is parent’s own reading
motivation instead. For New Zealand, both parental early reading support and parent’s own reading motivation have direct and indirect effects on reading performance. The mediating effects concerned are thus partial, not total. Implications of findings are made in the light of parental early reading support practices and motivational dispositions in the three culturally-diverse Asian Pacific economies.

**Demand or support? Parental Motivational practice to achievement in consideration of heterogeneity**

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International and national comparative studies such as PIRLS or TIMSS point out that there is a close relationship between students’ academic success and their social class as well as their ethnic origin. In Germany this relationship is an especially close one compared to other countries. While this relationship between social and ethnic background and academic outcomes is well documented, there are theoretical and empirical research deficits concerning the responsible processes. So far there are barely any results on how motivational differences between students of various backgrounds are related to differences in parental expectations, beliefs and response. It is the aim of a PhD-Project to focus on the link between family processes and students’ individual learning processes and academic outcomes, which allows conclusions on how educational disparities evolve. Against this background the concept of motivational practice of parents is introduced, which is applied to explain social disparities in academic outcomes. This contribution presents the results of a quantitative study. The study was carried out in 4th grade of German primary level. Besides students’ motivation to learn, and students’ achievement motivation, the relevance of parental beliefs, reactions, and values which are important for motivation, were measured. It could be shown that the relationship between academic outcome and social background is mediated by parents’ motivational practice. The results are discussed in the light of their theoretical and practical relevance.

**How do pre-service teachers perceive diagnostically relevant interactions in a teaching-dialogue?**

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Assessing students’ learning processes and learning outcomes is one of the most important teaching skills. Teachers need to be aware of students’ understanding in order to assess potential knowledge gaps. However, several studies have revealed significant deficits in pre-service teacher tutors’ and in-service teacher tutors’ diagnostic competences even in one-to-one tutoring dialogues. One reason for inaccurate assessment might be the teachers’ tendency to use expert knowledge as a basis for assessing and thus to make false assumptions about their students’ knowledge (expert blind spot). Additionally or alternatively, teachers might strongly focus on explaining and instructing in tutoring because they are unaware of interactional strategies that prompt the student to verbalize his/her thinking processes and thereby allow for a formative diagnosis of learning processes. Based on these considerations, the aim of our study was to investigate pre-service teachers’ knowledge about formative diagnostic interactions by showing them a video-taped one-to-one teaching dialogue. By asking pre-service teachers to observe the tutorial interaction and verbalize their thoughts in an interview, we explored the categorical patterns they use to interpret dialogues between teachers and students regarding diagnostically relevant interactional strategies. The results showed that pre-service teachers’ perceptions of the dialogue significantly differed from expert ratings. Particularly, pre-service teachers strongly focused on the teachers’ explanations and paid little attention the teacher’s interactional moves that encouraged the student to articulate his/her thinking processes. These results suggest that pre-service teachers’ sensitivity to diagnostically productive interactional moves is rather limited and should therefore be focused on in teacher education.

The salience of emotions in learning about teaching science at the primary level

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This study focuses on primary school teachers engaged in professional development around learning to teach science. The participants had all expressed their lack of confidence and interest in teaching science, and the focus on emotions for this research emerged from their expressed apprehension for science as a subject. Emotions are salient to teaching, especially when teaching a subject that is a new topic or discipline. I examined the contexts that supported teachers’ emergence of positive and negative emotions. I aim to work towards participatory analysis and interpretation for better understanding the complexities of facilitating learning to teach science.

Social media in education: An exploration of tensions between everyday practice and school practice

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This paper discusses the tensions related to social media sites (SNS) and education, thereby aiming to contribute to educators’ thought-out use of SNS in formal education. Because of students’ intensive SNS use outside school hours (Van den Beemt, et al, 2010), efforts to apply SNS to classroom learning can result in tensions between everyday practice and school practice. We investigate the ethical and pedagogical aspects of young peoples’ SNS use by applying contemporary learning theory as a lens,
substantiated by empirical data describing diversity in interactive media use among students. In this paper we explore the following aspects: tensions between educators’ and students’ use of SNS; contemporary learning theories that can address such tensions by relating learning to the network aspect of SNS; research describing diversity in digital media use among students. Because learners often use SNS as a means for identity development, using these sites as a direct learning tool can be problematic. Teachers have to themselves experience social media use for learning before they can follow the use of SNS among their students, and to address the attitudes, preferences and skills as possible connections between social media use and learning.

Social Media in Teacher Education: Preservice teachers learn from inservice teacher experience

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An educational technology course for preservice social studies teachers was explicitly designed to focus on technological pedagogical content knowledge (Mishra & Koehler, 2006) and Hooper and Rieber’s (1999) model of teacher technology use as a theoretical framework. Technology integration in social studies teaching was modeled for preservice teachers (n=29) in a course where they used social media to interact with inservice teachers who shared their experiences using new technologies. The participants used social media themselves and experienced first-hand how new technologies were used to teach social studies. The course was designed to guide participants through the phases of familiarization, utilization, integration, reorientation and evolution (Hooper & Rieber, 1999). Students’ perceptions of their learning during the course were recorded in their reflections during and at the end of the course. An open-ended analysis of students’ reflections highlighted perceived benefits such as collaborative learning, critical use of media, and lifelong learning from social media use. The discussion revolved around the challenges of using social media for educational interactions in and outside the classroom, the challenges of researching social media interactions, and the usefulness of using an explicit design framework for educational technology courses that integrates technology, content and pedagogy.

Research to application: Using frames to create Guided Cognition homework for unsupervised learning

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Our focus is on learning in unsupervised environments (represented by most homework). Guided Cognition structures study tasks to guide the learner to engage in specific, observable cognitive events. These events are hypothesized to elicit underlying theoretical cognitive processes that have been shown to improve learning. In a series of experiments conducted over the past seven years, we have found performance on unexpected quizzes to be consistently better for students who had performed Guided Cognition homework when compared to students who had studied the same content but performed Traditional homework. In our experiments on learning literature, the
cognitive events were: Role Play, in which the student answers as if he or she is the character; Visualize and Illustrate, in which the student creates a simple line drawing to help answer the question; Relate to Prior Experience, in which the student answers the question within the context of previous knowledge; Divergent Thinking in which the student answers the question from more than one point of view; and Brainstorm and Evaluate in which the student answers the question with a list of ideas and then rank orders the importance of these ideas. In this presentation we will define and give examples of Guided Cognition homework and of Traditional homework, will report in detail two experiments as examples of this research, and then will discuss how teachers, textbook authors, and instructional designers can use simple frames to create Guided Cognition homework tasks for a variety of content topics.

Teaching cognitive competence: Validation of a model and evaluation of instructional support

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Diagnostic competence with respect to classroom situations is central for teachers. However, support of learning to diagnose is still rare. The erroneous worked-examples approach seems promising to support diagnostic competence in pre-service teachers. This empirical study investigates to what extent a validated diagnostic competence model from medicine can be transferred to education. With respect to instructional support the study further investigated if error-explanation prompts and adaptable feedback can facilitate diagnostic competence. The validation study revealed a slightly different component structure of the diagnostic competence model than in medicine. The components strategic knowledge and conditional knowledge could not be differentiated. This might be due to possible differences in the nature of evidence for diagnosing in medicine and in teaching. Hence it can be concluded that the diagnostic competence model can be partially transferred from medicine to education. Error-explanation prompts had a positive effect on declarative knowledge if combined with adaptable feedback. Additionally, error-explanation prompts had a negative effect on action-related knowledge. An explanation of this pattern of findings might be that pre-service teachers in this study were still in an early stage of cognitive skill acquisition, where learners typically focus on understanding the domain principles (Renkl & Atkinson, 2010). Only in an intermediate phase learners can reflect on how abstract strategies are used to solve problems. Our study thus adds to this model as it gives evidence that a scaffold in form of an error-explanation prompt may be able to facilitate cognitive processes important for an early stage in skill acquisition.

Designing instruction in the perspective of the positive feedback model of interest development

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Instructional designs for interest development have primarily been seen as assisting students from a situational interest towards an individual interest. In this theoretical paper a discussion on the quality of the situational interest is discussed in the light of a new framework named the Positive Feedback
Model of Interest Development (Petersen, 2012). This model combines earlier theoretical works of Dewey (1913), Krapp (2002), and Hidi & Renninger (2006) in a dynamic approach to how interest is initiated and developed. This discussion leads to considerations for practice in designing instructions for interest development where learning environments must contain both accessible content knowledge and obstacles to overcome in the effort to access the knowledge.

A meta-analysis of the segmenting principle

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The segmenting principle assumes that people learn better when a multimedia instruction is presented in user-paced segments rather than as a continuous unit. The two key features concerning this principle consist of breaking a multimedia instruction into sequentially presented parts and of allowing the learner to pace the (segmented) multimedia instruction. The segmenting principle can be explained by facilitating chunking and structuring, by providing more time for processing the instruction or by the possibility of adapting the presentation pace to the learner’s individual needs. This meta-analysis includes over 25 experimental effects. Preliminary results reveal a significant segmenting effect with small effects for retention and transfer performance as well as a medium effect concerning overall cognitive load. At the conference, the final results of the meta-analysis will be presented as well as results concerning the three explanations of the segmenting principle. Furthermore, possibly moderating effects like learner’s prior domain knowledge as well as the presentation pace and the time which can be spent with the multimedia instruction will be considered in the analyses. The results will be discussed in regard to their theoretical and practical implications, as well as the limitations and future directions of this research.

Social Studies Teachers’ Use of Role Play and Simulations and the Making of 21st Century Citizens

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Even in today’s climate of high stakes testing, with its primary focus on students’ numeracy and literacy skills, the idea that public schools should educate students for effective and responsible citizenship remains uncontested. In the formal curriculum, the goals and objectives related to citizenship are often embedded in the social studies. The present investigation utilizes data from a national sample (N=10,269) to investigate two questions related to use of role play and simulations among social studies teachers in the USA: 1) Who among social studies teachers uses RP/S? and, 2) Is the use of RP/S associated with social studies teachers’ primary goals and instructional emphasis? Results revealed several statistically significant differences between social studies teachers’ who use RP/S rarely and those who use it often with regard to their demographic and experiential characteristics as well as their instructional goals and emphases. The largest and most important differences were related to teachers’ instructional emphasis on citizenship: teachers who reported high frequency (weekly or daily) use of RP/S were much more likely to emphasize critical citizenship values in their social studies instruction. These results are discussed in detail with additional findings and implications for educational practice and future research.

**School characteristics, teacher beliefs and innovative teaching practice**

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This study was a global multidimensional project that explored the relationship between innovative teaching practices and the development of 21st century skills. This paper presents the findings on the relationships between teacher beliefs, school level factors and innovation in teaching practices. The study surveyed 22 school leaders and 683 teachers in 22 schools across 3 geographic locations in NSW, Australia. Half of the schools surveyed had been designated ‘innovative’ and the other half were ‘matched’ based on geographic location, enrolments, and student demographics. Through multi-level regression analysis, various instructional and belief dimensions were compared to an Innovative Teaching Practice (ITP) Index that had been developed based on participant responses. While there were no significant differences in the ITP Index between the innovative and matched groups of schools, various teacher dimensions were important. At the teacher level age was most strongly related, with older teachers tending to be less innovative. Also, teachers who more frequently allowed their students to work on projects lasting for more than one week were likely to score higher on the ITP index. Dimensions such as such as collaboration, ICT use, Professional Development, fostering global awareness and self-regulation were found to have strong relationships with scoring highly on the Innovative Teaching Practice Index.
Effectivity of co-operative and individual/expert mentoring in didactic contexts

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From the point of view of constructivist learning theories, mentoring has to be seen as an effective teaching method because it is based on the individual’s difficulties and tries to solve exactly these difficulties. But on the other hand, individual mentoring is hard to realize in everyday teaching situations because it is very time consuming for the lecturer. Therefore the question emerges of whether co-operative mentoring may be as effective as individual/expert mentoring. From a theoretical point of view, it is believed that the advantages of co-operative mentoring settings may balance their disadvantages. The study presented in this paper, which was realized in a university course over one semester with 51 participants, gives first evidence that mentoring indeed supports learning and that the two forms do not differ in regard to their effectiveness.

More than beliefs: Subject-areas and teachers’ integration of laptops in secondary teaching

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The purpose of this paper is to explore the possible relationship of subject areas to teachers’ adoption of laptops in learning and teaching, in a large-scale 1-to-1 laptop initiative. Research in this area has confirmed that support, professional development, teacher confidence and beliefs are significant variables relating to technology integration. The following discussion argues that technology integration models should also consider subject-area factors, independent of teachers’ beliefs. The inclusion of subject-area considerations would include teaching and cultural conventions, such as forms of content knowledge and disciplinary traditions. This discussion presents a descriptive analysis of four subject areas, and their relationship to teachers’ technology integration. Findings suggest that ‘subject area’ could be included as a factor in a revised integration model. Implications for professional development in large technology-related initiatives and future research will be discussed.

Measuring Problem Solving Abilities in Childhood

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Problem solving abilities are seen as core-competencies (Klieme et al. 2005). Following the research question of comparing learning effects from inquiry learning and instruction on problem solving abilities, a new problem solving paradigm had to be found: the ZOO GAME. Within the ZOO GAME approach the participant has to transform a well-defined problem from a beginning state to a goal state by using a special set of complex rules (Fritz & Hussy, 2000). In a further step the instructional phase has been replaced by an inquiry learning scenario. This design of different pre-phases leads to a comparable planning phase, in which central indices measure the effectiveness and efficiency of interpolation problem solving. Two studies (N = 138 and N = 177) have been arranged in eleven primary schools of North-Rhine Westphalia. Comparing the dispersions of planning span between the learning groups a high significant difference is given, $\chi^2 (4, n = 138) = 26.01, p \text{ Eta}^2 = .43$. Under the exploring condition the numbers of best planners as well as the numbers of worst planners double. It becomes apparent that inquiry learning leads to better results in planning behavior concerning the effectiveness, but it is also widening the division between good and bad planners. These facts lead to the assumption that inquiry learning generates a different quality of knowledge.

**Creative collaboration for enhancing older adult’s ICT use**

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This study is targeted at meeting the opportunities that technology-enhanced life-long learning (TEL) can provide in Nordic society that emphasize the meaning of active ageing as a ‘process of optimizing opportunities for health, participation and security in order to enhance quality of life’. National European strategies have prioritised the need to promote older people’s access to the Internet and the need to understand their specific needs. However, recent studies show that some ageing people are avoiding or quitting the use of the Internet. In this symposium, we will analyse how creative collaboration in TEL can be supported among the elderly. Theoretically, creative collaboration is based on collaboration studies, and creativity denotes to the quality of collaborative processes. The aim of our study was to use technology (iPads) collaboratively and creatively for enhancing interaction and coping among older adults who took part in two-month informal education. The qualitative data includes the observation notes during the meetings and the interviews in the end of the intervention. The results show that creative collaboration is an effective way for older adults to
learn to use technologies, the participants underestimated their learning, and iPads. The study provided new knowledge about older adult’s processes on learning to use tablets.

**Problem solving competency - More than the sum of its parts?**

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The current study is about the validation of an in-basket task (InBox HD) as a means to assess problem solving competency. A problem is assumed to exist if someone wants to reach a goal, but does not know how to do so (e.g., because well-known paths that were useful in the past are not viable anymore). In order to solve a problem, different skills and abilities have to be integrated efficiently: Sometimes you have to gain expertise (e.g., by reading papers, asking experts or doing experiments) and sometimes you have to make decisions (e.g., under time pressure, given a sufficient amount of expertise). Both aspects are known to be important for problem solving (e.g., Dörner, 1986; Fischer, Greiff, & Funke, 2012; Funke, 2001), as gaining expertise (knowledge acquisition) is an important prerequisite for - but often interfered by (e.g., Sweller, 1988) - searching for a solution (knowledge application). The effective and efficient integration of knowledge acquisition and knowledge application skills in the course of real problem solving has been discussed as an important aspect of problem solving competency (Dörner, 1986; Novick & Bassok, 2005) but even if in-basket tasks (Frederiksen, 1966) and other simulations of complex problems (Dörner, 1986) have been proposed to measure problem solving competency, the incremental value of measuring this integration of skills has never been proven conclusively (Sands, 2001).

**Tower-of-Hanoi Reloaded: Types of Error in Problem Solving Processes**

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The traditional paradigm Tower-of-Hanoi problem (TOH) has long been an important task environment for research in problem solving in adulthood and reflected the concept of problem-space in a fruitful way (Kotovsky, Hayes & Simon, 1985). TOH has never been used systematically in problem solving research in childhood and adolescence. For completing this huge research gap the TOH has been digitalized in a computer-based version (TOH-D) suitable for young persons. The data of two studies in childhood (N=47) and adolescence (N=276) leads to a completely new point of view in analytical problem-solving. The problem-space should be differed from the planning-space, which produces new indices in analyzing problem solving processes (PSP) and reveals two types of error in PSP. In problem-spaces the error-type I (inefficiency) is a necessary state, while error-type II (ineffectiveness) should be avoided completely. In planning-spaces both types of error has to be eliminated. Comparing both studies shows that only avoiding inefficiency developed well from childhood to adolescence. Thus using the TOH-D in modeling the development of PSP leads once again to the question of factors of an operative intelligence.

**Processes of boundary crossing and learning around technological innovations at work**

Liesbeth Baartman
Work is increasingly heterogeneous and interdisciplinary and employees more frequently have to collaborate and communicate with colleagues from other vocations. Due to technological developments, they need to constantly adapt their knowledge and skills. However, vocational education often focuses on a specific vocation and regards boundaries as problematic instead of opportunities for learning. This study focuses on boundary crossing in the communication and collaboration between nurses and technicians. We studied (1) the processes of communication and collaboration at the boundary and (2) what the nurses and technicians learned during these processes. In two case studies, 8-hour observations and 11 interviews were carried out. Data were analysed thematically with a focus on boundaries, communication processes and learning. Results showed that both vocations established boundaries and that their collaboration indeed could be characterized as boundary crossing. In their communication, processes of modeling, explaining, information and problem analysis became apparent. Learning focuses on system thinking and both nurses and technicians used reasons from outside their own vocation to guide their actions and decisions. Implications for theories on boundary crossing, communication at work and vocational education will be discussed.

Overcoming Academic Procrastination by Fostering Self-Regulatory Processes in a Group Training

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Academic procrastination, the voluntarily and irrational delay of an intended course of action, can have negative effects on students' well-being and academic performance. In the present study, we developed and evaluated a group training to reduce academic procrastination. Because different investigations have shown that procrastination is related to insufficient skills and processes in self-regulated learning, the training was theoretically based on the model of self-regulated learning established by Zimmerman (2002). Thus, students acquired strategies to improve goal setting, time management, self-motivation, self-reflection, and to resist temptations and distractions. The group training comprised 5 sessions and took place once a week for 90 minutes in groups of no more than
10 students. Overall, 109 students (59 female) completed the training. We evaluated the training by using a control group design with repeated measures (pretest, posttest, follow-up). The control group was trained after the training of the experimental group. The evaluation revealed that the training was successful in reducing academic procrastination as well as optimising time management, concentration, and self-efficacy for participants in the experimental group and in the control group after they had been trained. Furthermore, the percentage of accomplished work according to the participants’ intentions increased between the sessions 2 to 4. Thus, our training demonstrated that fostering self-regulatory processes is a promising way to help students overcome academic procrastination. To prevent students from procrastinating, universities could consider offering such group trainings for all students at the beginning of their studies.

Surviving and succeeding as an early career academic

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Previous research has established a close link between lecturers’ approaches to teaching and their conceptions of good teaching. Experiences during the initial years of academic careers have a great influence on the development of university lecturers’ conceptions of learning and teaching, their values and their professional identities as university scholars. This research aimed to develop the understanding of Estonian novice university teachers’ conceptions of teaching and what influenced their teaching practice. Two semi-structured interviews were conducted over two years with 15 early-career university teachers from different higher education institutions and disciplines. The novice university teachers’ beliefs and conceptions of teaching were analysed using qualitative thematic analysis. It became evident from the results that novice university teachers are only just beginning to define and seek their teaching conception and try these out in their teaching practice. The research results demonstrated that novice university teachers’ teaching conceptions are not stable. Change in teaching conceptions became evident in teaching practices’ descriptions of those university teachers, who had had a change in context (e.g. had completed doctoral studies, made academic or administrative career) or of those university teachers, who were continuously reflecting upon their teaching practices and were consciously developing their teaching skills.

Identifying types of informal learners: a latent class approach

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We aimed to investigate how individuals differ in: (a) their interpretations of learning potential of the work task; (b) informal learning; and (c) their perceptions of social support. The research question is
whether the employees could be classified into different groups with regard to these variables. Informal learning is defined as a process that can be deliberate or reactive in intention, and that leads to competences but not to formal qualifications. It can happen individually or socially. Learning potential is defined as the potential of a work task to trigger informal learning. The learning potential rises with the opportunity of a work task to reveal an error or knowledge gap. Learning depends on the social support available. Relational variables which moderate the use of the offered support are: (1) knowing what that person knows; (2) valuing what that person knows and (3) trust in that person. The sample consist of N=300 software developers from small and medium-sized software firms in Germany. For the online data collection in fall 2012 validated scales are used. The data will be analyzed by means of latent class analysis. It is expected that groups will be characterized by answer profiles that show clear orientation towards informal learning in relation to the perceived learning potential of the work and social support. In this presentation we will elaborate on the results of the latent class analysis and discuss implications for supporting informal learning.

**Guiding dialogic joint elaboration of student teacher’s situational representations**

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Significant literature on the nature of teachers’ knowledge has largely suggested that teachers’ practice is mainly guided by situational representations. From this view has been suggested that the problem of the minimal impact of teacher education on teachers’ practice can be explained because while in teacher education what is learned is basically propositional knowledge, teachers’ practice is instead mainly guided by situational representations. This study explores how situational representations can be elaborated and developed in University, by analyzing the university lector guidance of student teachers joint elaboration of school situations. The study proposes three research questions: 1) how does the lector guide the joint (dialogic) elaboration of situational representations by students? 2) How do the situational representations used by students develop? 3) How are related the dynamic of the lector’s guidance and the development of representations used by students along the process? To answer these questions we conduct a case study including two cases, each one consisting of five sessions, and we apply content analysis on the video-taped sessions and on the individual reflections that students wrote after each session. We complement these analyses with a questionnaire to students and a focus group of lecturers. The findings suggest that certain types of guidance by lecturer foster development of certain aspects of situational representations. Patterns of lecturers’ guidance were identified along the five sessions and the
individual reflections by students presented a significant increase in the ratings of coding categories along the sessions.

**Influence of student characteristics and learning environment on motivation for collaboration**

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Various review studies show that CL can positively influence learning (e.g., Lou, 2004). Intrinsic motivation for collaboration is important for an effective CL process (Slavin, 1996). In the current study, we focus on what factors influence intrinsic motivation for CL. We distinguish between individual differences of students such as collaborative skills and perceived competence, and features of the learning environment, such as perceived autonomy support and frequency of CL opportunities in class. the research question is: Which collaborative learning skills and features of the learning environment influence feelings of competence and intrinsic motivation for CL in grade 5 and 6? This study involved 3487 fifth- and sixth-grade students of 88 primary schools in The Netherlands. Students were administered to a paper and pencil questionnaire during school hours. The influence of collaborative skills, autonomy support and frequency of CL on feelings of competence and intrinsic motivation was examined through structural equation modelling analysis with Mplus. These results show that practicing CL in class can increase intrinsic motivation for CL. Providing options to choose when or how to collaborate does not influence intrinsic motivation directly, but seem to influence the development of collaborative skills which can be useful for an effective learning process and increased the feelings of competence. This means that it is important for a teacher in order to stimulate the intrinsic motivation of students for CL to teach autonomy-supportively and to often use CL as a didactic method.

**Collaborative writing on professional experiences to foster reflective capacity in VET curricula**

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Reflection on workplace practices in VET curricula is conceived as a promising process to develop the connectivity among the different learning places (school, company and intercompany courses). More specifically, reflective journal writing is considered a powerful mediating tool for promoting reflective attitude, developing deep learning and consolidating professional competence. These general assumptions have been tested in a study involving apprentices office clerk in some collaborative journal writing activities on their experiences at the workplace. We hypothesize that peer commenting and revising learning scenarios have an influence on the quality of apprentices’ journal entries (H1) and that describing professional experiences lived on the job and commenting the peers’
ones in a collaborative way enhance apprentices’ capacity to describe and reflect on professional procedures (H2). The results obtained are encouraging showing that the collaborative scenarios do have an impact on the quality of journal entries and that apprentices’ reflective capacity.

**Parenting styles and academic cheating among first-year college students**

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While many studies lend support to the relationships between parenting styles and types of deviant behaviors in children and adolescents, there is a dearth of research on the relationship between parenting styles and the tendency to cheat among students at the emerging adulthood period. This study used structural equation modeling to identify which perceived parenting styles of authoritative, authoritarian and permissive - will predict the tendency to neutralize academic cheating, mediated by academic extrinsic/intrinsic motivations and self-efficacy perceptions among 159 first-year college students. Regarding an authoritarian parenting style, the path analysis model showed a direct positive effect on the tendency to neutralize academic cheating, and an indirect positive effect on it via extrinsic motivation. Insignificant direct connection was found between the perception of the parents as authoritative and an academic cheating neutralization. However this parenting style indirectly reduced the tendency to neutralize academic cheating through increasing intrinsic motivation and academic self-efficacy perception. An additional result showed that authoritative parenting also positively affects extrinsic motivation. This finding is discussed in conjunction with the positive contribution of extrinsic to intrinsic motivation as been also indicated by this study’s empirical model. Finally, a positive direct contribution of a permissive parenting style to neutralization of academic cheating was indicated. Implications of these findings and directions for future research are discussed.

**The effects of parenting styles on academic motivations and adjustment to college life**

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Entering college incorporates academic, social and psychological challenges in the dynamic process of adjustment. During this process the student encounters multiple transitions including changes in academic environments and friendship networks which could affect his or her chances of obtaining a degree. Many studies lend support to the importance of parental contribution to the process of adjustment to university. While, most of these studies have tended to address more generalized factors of parenting, the current study was conceptualized as an attempt to formulate a model to identify which variables of the authoritative, authoritarian and permissive parenting styles, as defined by Baumrind (1967), may serve to influence extrinsic/intrinsic motivations and amotivation, which in turn are likely to affect adaptation to college. Data were collected from a sample of 247 first-year students. Structural equation modeling results indicated that permissive parenting style is positively connected to amotivation for learning which in turn positively predicted maladjustment to college. Authoritativeness was found to indirectly enhance the adjustment variable via the motivational constructs. Concerning authoritarian parenting, results indicated positive direct as well as indirect connection to the maladjustment variable, through the amotivation factor. Since, as shown by this study, the family microsystem in some cases fails to provide the student with psychological support needed during the process of adjustment to college, this effort should be a concern for the college microsystem through, for example, campus counseling service, which should play a preventive role assisting students in identifying psychological and adjustment problems that require professional attention.
Emerging transformations: Traversing conceptual thresholds across disciplines

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According to threshold concept theory (Meyer and Land, 2003) concepts that are troublesome to learn are also transformative when mastered: the acquisition of threshold concepts conduces the change in the student’s understanding of a discipline, what it means to be a disciplinary expert, and engenders in students deep knowledge and learning throughout the student’s life span. Educational researchers in New Zealand have been working with tertiary lecturers in electronics engineering, doctoral writing, leadership in management communication, and in the arts (English), to identify and teach threshold concepts in and across disciplines and to create learning environments for sustainable learning. Through two cycles of collaborative action-research, changes in lecturers’ threshold concept-informed teaching and supervision, the impact of a threshold concept-informed curriculum, pedagogy, and assessment on student learning, have been explored. Data from interviews with lecturers and research team discussions about the nature of threshold concepts, their identification in the study-courses, and the development of threshold concept-informed curriculum and pedagogy were collected. Lecturers have reflected on their teaching to help them reshape their pedagogy and supervision. Students’ ideas about threshold concepts and their learning have been explored through surveys, interviews, observation, and achievement data. Statistical analyses show differences and trends in student achievement and opinions. Qualitative data have been used to examine changes in teaching, supervision, and learning. Discussion of results has used
ideas from complexity theory to provide evidence of whether and how knowledge of threshold concepts can emerge through self-organisation (Reigeluth, 2008).

**University students’ experiences of different aspects of teaching-learning environment**

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The aim of this article is to investigate the views of university students on the factors of the university as a teaching-learning environment. The research data consist of 81 short essays written by students where they narrate their experiences about the university as a teaching-learning environment. According to the results, the majority of the students are satisfied with the university. In more critical answers, the wishes are directed towards a wider appreciation of students’ educational backgrounds and study conditions. Students also hoped for more optionality in course choices and more personal staff-student relationships. Regrettably often the student centrality is not perceived in the students’ answers in a self-directing mind but the responsibility for the commitment and for the building of the significances of the learning is left to the teacher. The teaching-learning environment has a diverse influence on the teachers work as a whole, but according to this study, the students, however, intelligibly regard the teaching-learning environment as inner teaching-learning environment only.

**The relationship between students’ conception of good teaching and their views on a good text book**

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Students’ views on learning and good teaching are closely linked to their interpretation of various aspects of the learning environment and the quality of their learning outcomes. Teachers’ views on learning and good teaching seem to influence their views on good learning materials and a good text book, and their use of these. More epistemological sophisticated teachers have a larger repertoire of teaching skills and they see more diverse uses for text books than less sophisticated teachers. Text books are an integral part of the students’ learning experience, but their views on what a good text book is and the possible repercussions for the quality of their learning have not been taken into account. In this study the link between students’ learning and teaching conceptions and their views on a good text book is examined. Short essays of some 220 second year university students were analysed using the classical phenomenographic method, emphasising the ‘whole of transcript’ approach. The initial results show that links exist between student’s levels of epistemological sophistication and their views on a good text book, similar to those found earlier for teachers. Full results will be presented at the conference.

**Learning and Teaching Cultures in Higher Education: Turning the Vicious Cycle into a Virtuous One**
As wider and more diverse audiences attend universities, nowadays, more advanced instructional approaches are required. We report on a continuation of a previous three-year long study, focusing on students’ learning-culture, which examined a pedagogical-technological innovation infused into an introductory biology course, at an established academic institution. An online-tutorial was used in the most advanced level of the intervention as the main resource for student self-learning of course content. In parallel, students participated in a more in-depth process in small knowledge-building teams, each focusing on a specific course topic. Findings indicated that students’ learning-culture was highly affected by the teaching culture encapsulated in the course design. In the current study, we interviewed six introductory course instructors at the same institution. These interviews, comprised of 427 utterances, were analyzed phenomenographically. Findings reveal compromises in teaching, made by these instructors, based on their faulty views about the learning culture of ‘the typical student’. We conclude that reciprocal relations exist between learning-culture and teaching-culture, which may cause stagnation of traditional instruction in higher-education.

Effects of the Bologna Reform on the competencies of students

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Effects of the Bologna reform on the competencies of students in Business Education and Business Administration & Economics There has been a considerable amount of spirited public dialogue about the Bologna Declaration (the Reforms); however, this largely controversial discussion has rather normative characteristics. Indeed, the effects of the Reforms still lack empirical proof. In this presentation, questions from the topical Bologna debate will be discussed critically, based on the results of four quantitative surveys that were part of the ILLEV research project. In addition, a comparison will be presented of the phased-out Diploma and the new Bachelor and Master degrees in Business Education and Business Administration & Economics. Above all, the comparison focuses
on the cognitive, motivational and social preconditions and the content knowledge of students of business and economics. The presentation will close with a discussion of some of the implications regarding the politics and practices of research into higher education.

**How Business Students’ Attitudes towards their University and Studying Develop during the First Year**

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The aim of this qualitative study is first to investigate the attitude development of students in their initial year at university. College effectiveness research has shown that attitudes towards studying as well as to one’s university are key factors influencing student engagement. Up to now, little is known about the processes through which such attitudes develop. Based on the theory of planned behaviour (Ajzen & Fishbein, 1980), the study addresses this research gap in three parts: a) development paths of students’ attitudes towards studying and the university; b) the normative behaviour of the fellow students as well as significant persons, c) university-related experiences during the first year influencing students’ attitude development. To answer these research questions, a series of five interviews was conducted throughout the first year with a total of 13 first-year students at the University of St. Gallen/Switzerland. Data analysis was performed referring to the procedures suggested by Neale (2012) for qualitative longitudinal data. To master the challenge of displaying developments over time, graphical analysis was used to construct a case history (cf. Henderson, Holland et al., 2012) for each individual. Regarding the students’ developments over time, the analysis shows the participants’ attitudes towards the university became more differentiated over time. A second major result concerns frictions between students’ own attitudes and what they perceive to be the dominant normative behaviour. It became obvious that this developmental process is influenced by concrete incidents students experience during the first year and thus, can be shaped by structural changes.

**Factors Which Promote and Hinder Pedagogic Change in a Professional Development Community**

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Collaborative frameworks are highly valued as an effective tool for professional development of educators. This research examines critical factors in a professional development community which enhance and hinder significant learning aimed at pedagogic change. This four year qualitative longitudinal study of 20 teacher educators used a variety of data sources including interviews, reflective writings, recording of the sessions and implementation artifacts. Factors found to promote change in practice included creating a safe environment for teacher learning, group reflection and feedback, teacher research, and continuity. Breaking of isolation in some circumstances promoted learning and implementation and in others it prevented these processes. Individual withdrawal from the professional development’s goals was understood as ‘quiet resistance’ which strengthened
participants’ non-learning, thereby avoiding change. The clear delineation of factors which promote and sometimes hinder professional growth and change fills a gap in existing research by focusing on dynamic group processes as they relate to the desired outcome of sustainable pedagogic change.

**Relevance of networking for doctoral students’ professional development**

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Different supervisory cultures foster doctoral students on their way from novice to an autonomous researcher. In Germany supervisory cultures range from a traditional doctorate where students get only support by their supervisor to well structured graduate schools where students are embedded in networks at an early stage of their doctorate. Although these supervisory cultures seem contrastive, all of them are based on a perspective of social learning. Doctoral students learn domain specific skills by becoming part of the scientific community. Consequently, doctoral students are socialised by and enculturated into the scientific community. Up to now, we know only less about how doctoral students are really embedded in network relations and how they perceive these relations as supportive for their own professional development in different supervisory cultures. The purpose of this paper is to examine the relevance of doctoral students’ networking for their professional development. Doctoral students (N=20) in different supervisory cultures were interviewed using a semi-structured interview protocol. We collected (1) contacts of doctoral students to peers, mentors and supervisors using ego networks, (2) information on students’ intentions for getting in contact with people, and (3) relevance of these relations for the students’ own professional development. Qualitative content analysis was used to analyse the interviews; ego networks were analysed based on network measures. Findings show that all doctoral students highly rate the possibility of participation in networks. But networks of students providing their doctorate in a traditional way were more diverse than of students integrated in graduate schools.

**Fostering team competences in schools by guided reflexivity**

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Cooperative learning is a popular method for classroom teaching since it makes it possible to consider individual differences as well as to achieve various educational goals (academic as well as social). Additionally, it corresponds with the socio-constructivist notion of learning (Antil et al., 1998). Many different factors influencing the effectiveness of cooperative learning have been identified (Abrami & Chambers, 1996). In recent team research there is a strong empirical evidence for the positive effect of reflexivity on group effectiveness and performance, mainly in organizational settings (e.g. West, 2000; West et al., 1997, Carter and West, 1998; De Dreu, 2002, 2007; Hoegl and Parboteeah, 2006). This study examines the effect of guided reflection on team processes, team performance and additionally on team competences in the context of team work in schools, based on West’s (1996, 2000) concept of reflectivity. So far a reflexivity intervention has been developed, which
is now tested within teamwork in regular subject-specific classes regarding its effectiveness. The study comprises a longitudinal analysis in the field by running two conditions, a control condition and a group reflexivity condition. The relationship between team reflexivity and team competencies and task-related effectiveness is evaluated by relevant constructs like for example team competencies, the reflexive behavior regarding task-related as well as social team processes or various control variables at different measuring times.

Collaborative learning in the mathematics classroom: a theoretical model to guide teacher practice

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Collaborative learning is a well-researched instructional approach that is highly effective and often superior to individual learning. However, this effect depends on the quality of the collaborative, cognitive, and meta-cognitive activity that students show during the interaction and which in the end determines the fruitfulness of the collaboration. So, what do teachers need to know in order to create and support these beneficial group interactions? We developed a model describing teachers’ competencies required for Implementing Collaborative Learning in Mathematics (ICLM). The model describes teacher practice in three phases (pre-active, inter-active, and post-active), during which teachers need different ICLM competencies: planning collaborative learning, monitoring students’ interactions, supporting beneficial collaborative behaviors, consolidating groups’ work and reflecting on process and outcomes of the lesson. The ICLM competencies are illustrated with empirical findings that may guide teacher practice. Based on the model, we are developing an assessment tool and a training of ICLM competencies. Our ongoing studies with the assessment tool and the training will help test the assumptions of the ICLM model.

Self-Report Data as a Critical Piece of the Self-Regulated Learning Puzzle

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Self-regulated learning (SRL) refers to the active engagement of learners in their own learning (Winne & Hadwin, 1998). Self-regulated learners deliberately plan, monitor, and regulate cognitive, behavioral, and affective processes. Measurement of SRL is inherently challenging and self-report data have been criticized (Winne, Zhou, & Egan, 2011). Self-report measures of SRL have tended to be aptitude measures and views of SRL as fine-grained and dynamic have shifted focus to more objective measures. However, SRL processes are covert and dependent on learners’ perceptions, thus self-report data are critical for understanding SRL when triangulated with further data. To illustrate the importance of self-perceptions in researching SRL, two participants were purposefully selected who had high scores on the Regulation of Learning Questionnaire (Hadwin, 2009) but different profiles of SRL. Additional data both qualitative and quantitative suggests that one participant was very aware of challenges in her learning and adapted her learning to overcome these. The other participant demonstrated little evidence of actively adapting to face challenges. These two participants demonstrate that in order to diagnose and remediate studying problems, understanding learners’ own perspectives and the relation to what they are actually doing is essential.

How accurate are teachers’ judgements of students’ learning strategy use?

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As learning strategies proved to have a positive impact on learning performance and can be fostered by strategy trainings, more and more teachers train their students in cognitive, metacognitive and motivational learning strategies during lessons. Before delivering strategies, teachers should decide which learning strategies need to be trained to deliver learning strategies more systematically. Therefore we examined how accurate teachers’ judgements of students’ strategy use are compared to their judgements of students’ learning performance. Furthermore, differences between judgements of students’ cognitive, metacognitive and motivational strategy use were analyzed. It was assumed that students underestimated in learning performance were predicted less strategy use than overestimated students. Students of 9th and 10th grade Gymnasium classes were assessed in learning strategy use while text reading as well as their learning performance. Their teachers judged students’ learning performance and learning strategy use. Results did show higher accuracy of learning performance compared judgements of cognitive and metacognitive strategy use. In particular, teachers’ judgements of students’ cognitive learning strategies were more inaccurate than judgements of metacognitive and motivational strategies. Moreover, students overestimated in learning performance by their teachers were predicted more learning strategies than underestimated students. If teachers overestimate students’ strategy use, the necessity of learning strategy training might be underestimated.

Putting SRL strategies into practice: the role of self-efficacy and perceived usefulness

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The present work tends to contribute analyzing the mediating role of the self-efficacy to self-regulate learning and the perceived usefulness of self-regulatory strategies (SRL-S) into the effective use of them at higher educational levels. An interventional program was implemented assuming that teaching SRL-S and putting that knowledge into practice during the training would improve the self-efficacy for the use of such strategies and its potential applicability, increasing the use of the SRL-S trained. The path analysis shows that the program is effective in changing the initial levels of Knowledge of SRL-S only, neither significant effect on self-efficacy to SRL, nor in usefulness of SRL-S nor in using SRL-S. However is observed that this effect is indirect through the variable SRL-S knowledge. SRL-S knowledge and self-efficacy to SRL positively and significantly impact on the use of SRL-S (mainly self-efficacy), nonetheless not in the case of the variable usefulness of SRL-S. This fact may indicate that the levels of this variable maybe depend more on aspects out of study and students control. As a result, to involve both students and professor in the interventions is the future and necessary prospect. The present work has been funded by the Spanish Ministry of Science and Innovation: Project Ref. EDU2010-16231.

Learning and instructional activities for promoting self-regulated learning in universities

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Methods of promoting self-regulated learning (SRL) in university learning and instruction were investigated using qualitative and quantitative methods. Graduate students (N = 60) alternatively took the role of an instructor or a learner. Learners rated the usefulness of learning and instructional activities. Results indicated that lecture by students were rated higher than collaborative work, teacher’s talks, term papers, problem solving, and a survey on instructions. Reasons for the ratings were categorized into instructional content, instructional methods, learning, self, others, diversity, significance, and affect. SRL variables: SRL, peer modeling, multiple modeling, teacher modeling, self-reflection, interest, and peer learning were specified by focusing on the related categories. Residual and correspondence analyses revealed the characteristics of activity by category, and by SRL variable. The results suggested the significant role of each activity: The lecture by students was the most useful for learning, because they provided peer and multiple modeling. Collaborative work was useful for learning different ideas from peer models and for learning from each other through discussion. Teacher’s talks helped students become self-regulated learners by modeling instructional content and methods. Talking about the teacher’s own concepts of education and attitudes about research was also effective. Term papers and problem solving provided learners with opportunities for self-reflection about their efforts. Problem solving was also useful for deepening learners’ own learning. Moreover, the survey on instructions was an opportunity for promoting SRL during forethought, performance, and self-reflection.
Task-oriented reading of multiple documents: Online comprehension processes and offline products

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We explored readers’ judgments of text relevance and strategy use while they read about a controversial scientific issue in multiple conflicting documents using a think-aloud methodology and had them write a short essay after reading. Participants were university-level students. There were two main findings. First, the frequency with which they used strategies differed while they read more- and less-relevant information. Specifically, while they read more-relevant information, students were more likely to build connections between that information and information in other texts. Second, their judgments of more-relevant segments as relevant and their evaluation of less-relevant information while they read were related to the quality of students’ essays after they read. We discuss how the findings may contribute to the literature on task-oriented reading of multiple documents.

Development of Sentence and Word Processing Skills in English and German – An Eye Tracking Study

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Eye movement patterns of typically reading English and German children and adults were monitored while they read sentences aloud. The sentences were highly similar in both languages and contained target words manipulated for length and visual familiarity. We sought to study the development of global sentence reading processes as a function of orthographic consistency as well as the development of local word recognition processes as a function of length, visual familiarity, and orthographic consistency. We expected orthographic consistency to influence the size of processing units for both children and adults, but differences were expected to be more pronounced in children. Results showed important differences between readers of the two orthographies for both global
A typology of students’ reading engagement for teacher-directed reading intervention proposals

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The present study seeks to develop a typology of college students’ reading engagement aiming at providing research-based evidence to inform practicing teachers on how to help students advance in reading literacy development. After establishing through literature review that fondness of reading, aspiration for reading, and ability for reading are reading engagement variables affecting reading literacy performance, the effectiveness of these variables are confirmed using Macao data drawn from the PISA 2009 Reading Literacy Study. Apart from using a variable-centered data analytic approach, a person-centered approach is adopted for making evidence-based teacher-directed reading intervention proposals. Using latent profile analyses, a typology of college student reading engagement classified in terms of the empirically verified reading engagement variables is developed. The present study reveals that in the 45 schools in the Macao data there are eight latent classes of students each of which can be identified with specific reading engagement characteristics. Evidence-based reading intervention proposals may then be made so as to inform practicing teachers to help college students enhance their reading literacy performance. Keywords reading engagement, reading enjoyment, reading strategy, reading literacy, latent profile analysis

Phonological awareness training in kindergarten and first grade in Turkish: a preliminary study

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The purpose of this study was to develop two sets of materials for phonological awareness (PA) training in Turkish, face-to-face activities for classroom use, and educational software for individual use, and to test the effectiveness of these materials in improving PA skills at the kindergarten and first-grade levels. Given the orthographic transparency of Turkish, some of the processes involved in
PA development might differ from those in an orthographically opaque language, and therefore require other, specific forms of training. A total of 215 kindergarteners and first graders from the same school district in Istanbul participated in the study. There were 2 experimental groups (software and face-to-face) and a control group. The two types of training targeted the same PA skills, and the effect of each type was tested in a pretest-posttest format, where letter knowledge, rapid automatized naming, and short term memory were also measured. Preliminary analyses show that the PA skills of children in the experimental groups improved significantly compared to that of children in the control group. The study will be an important contribution not only for the development of a PA program for early literacy instruction, but also for identification of the relation between PA skills and reading in Turkish.

**The influence of writing skills on the temporal organization of the writing process**

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Writers do not only differ in the amount and type of cognitive activities undertaken during writing but also in cognitive and linguistic skills. We hypothesised that within a group of 12-year old students differences in cognitive and linguistic skills would influence the occurrence of cognitive activities during the writing process, resulting in texts of different quality. Therefore we re-analyzed 30 thinking aloud protocols of thirty 12-year old students gathered during a writing task. These students also completed a test on linguistic skills and two tasks regarding cognitive skills. Results showed that during the writing process individual differences in the occurrence of cognitive activities over time were due to differences in linguistic or cognitive skills.

**Electronic outlining: Effects on students’ writing products and processes**

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Writing is an important and complex skill which can be enhanced by effectively using writing strategies that help monitoring the writing process. This study focuses on using electronic outline-tools as a specific support for a planning strategy. Focus is not only on final writing products but also on the orchestration of the writing process and students’ perceived mental effort during writing. In this study, a combined within- and between-subjects design was used. The writing products, writing processes and self-report data on mental effort from 95 tenth-grade students were analyzed. Students wrote two argumentative texts with or without an outline-tool. Results show that electronic outlining positively influenced students’ writing products. Using an outline-tool significantly improved the presentation of the argumentative structure and the total text structure. Process data suggest that outlining increased total writing time, but no outline effect was found on students’ planning and reviewing behaviour. Finally, self-reports show no outline effect on students’ perceived mental effort. Nevertheless, mental effort decreased when repeatedly using the same writing strategy. Moreover, results show an outline effect regarding students’ perceived mental effort on the specific aspect of text structuring. Electronic outlining decreased mental effort for structuring over both writing tasks.

An evidence-based switching intervention showing improved number agreement skills in written French

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Switching ability can be defined as the ability to switch between two tasks or two rules when performing a particular task. One example is the ability to switch between the noun and verb rules of number agreement in spelling. The present study used the effect to determine the extent to which a switching intervention influenced the acquisition of number agreement. Teachers trained children from grades 3 and 4 over a period of two months. Children were randomly assigned in two experimental interventions: 1) a switching intervention composed of exercises where children were asked to fill in sentences with nouns and verbs that switched between the two grammatical rules to make the noun or the verb agreed; 2) a simple intervention composed of the same exercises, except that the children were asked to fill in the sentences exclusively with nouns in the first half of the intervention and exclusively with verbs in the second half of the intervention. The results showed that children made significant spelling gains in both kinds of interventions. Moreover, children from grade 3 learned better from the switching intervention than from the simple intervention. In contrast, the older children from grade 4 demonstrated the same degree of improvement in both kinds of interventions. These findings suggest both how these abilities can be better developed at
school and, more precisely, that switching intervention may indeed influence children’s initial progress in learning to spell number agreement.

**Promoting Planning or Sentence-Combining Skills: Effective Interventions at Different Textual Levels**

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Among others, learning to write requires the mastering of planning and sentence construction skills. The present study compared the effectiveness of two instructional programs aimed at promoting fifth and sixth graders’ planning or sentence-combining skills (N = 126). Following the Self-Regulated Strategy Development model (Harris & Graham, 2009), students were taught a strategy to plan opinion essays (planning group), or a strategy to combine sentences in a single sentence (sentence-combining group). These two strategy groups were compared with a control group, in which students followed the standard school curriculum. After instruction, the planning group wrote better plans than the other two groups. Conversely, the sentence-combining group correctly combined more sentences than the other two groups. Moreover, both strategy groups wrote qualitatively better texts than the control group. Specific effects were also found. At the text level, the planning group scored higher than the other two groups in the number of reasons and elaborations, and in text coherence. At the sentence level, the sentence-combining group surpassed the planning group, which, in turn, surpassed the control group, in the variety of connectives, and number and variety of opinion markers. At the word level, both strategy groups used more diverse vocabulary and wrote a wider variety of modifiers (adjectives and adverbs) than the control group. In sum, both strategy intervention programs were effective in promoting overall writing quality, but seem to have done so at different textual levels. This suggests that effective writing interventions need to target several levels of text production.

**‘Clinica della formazione”: a reflective practice for Teacher Education**

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The European Union is focused on quality education through which European citizens can acquire knowledge and skills useful in life, both personally and professionally. To achieve this, it is necessary and appropriate to innovate training of educators and teachers. They need to be prepared through training models that will allow them to operate properly, need further information related to their discipline of teaching, but also pedagogical and psychological skills that enable them to be able to consider the learner and their needs from a perspective of long-life learning. This theoretical paper describes a training and research methodology, ‘Clinica della Formazione’ of Riccardo Massa (1987, 1990, 1992) in which educators and teachers are helped to reflect about their performance and to develop the use of critical thinking in their job. The aims of this study is to demonstrate that reflective practice can become a strategic competence capable of supporting professional educators.
and the growth and development of the new generations in authenticity, serenity, critical thinking, authenticity, creativity, freedom and responsibility.

**Fostering Systems Thinking in School: Enablers and Barriers to Develop a Comprehensive Qualification**

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Systems thinking is considered an ideal approach to complement analytical thinking. However, the question arises how schools deal with the integration of such a comprehensive cross-curricular innovation. The current study investigated the main factors influencing the adoption of systems thinking in the classroom. In a standardised one-day training session teachers were introduced to the basic concepts and tools of systems thinking as well as to ways to apply them in their classroom. Data were collected in a pre-post-post design with three questionnaires (t1-t3). Analysis of classroom materials and semi-structured interviews (t3) were conducted to get in depth answers to some of the questions of interest. Participants were categorised in four groups: (1) voluntary participation with implementation; (2) voluntary participation but no implementation; (3) compulsory participation with implementation and (4) compulsory participation without implementation. Preliminary results show that the four different groups of participants differed significantly regarding a variety of supporting factors and barriers such as the importance of the attribution of significance and previous knowledge.

**Researching the long-term impact of teachers’ professional development**

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This presentation deals with the sustainable effectiveness of professional development programmes. It links theoretical considerations with research findings from two case studies about secondary mathematics teachers, who took part in the Austrian nationwide teacher professional development programme IMST. The results provide information regarding the teachers’ professional growth and the sustainable effects of the professional development programme. The presentation also discusses implications for the design of teacher professional development programmes.

**Teachers’ perceived professional agency in the classroom and in the professional community**

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Teacher learning has been suggested to be a key not only for professional and school development but also for providing meaningful and engaging learning environments for pupils. In this study, teacher learning in terms of professional agency is explored in two primary contexts of teachers’ work: in the classroom interaction and in the professional community. Altogether 2310 comprehensive school teachers, including primary (n=815; 35%), subject (n=729; 32%), and special education teachers (n=761; 33%) completed the survey. The analysis was carried out by using structural equation modelling (SEM). The results showed that teachers’ professional agency includes several key factors that promote simultaneously teachers learning. More specifically, learning in teacher-pupil interaction (3 items, a=.75), learning about teaching (4 items, a=.70), learning for self-regulation (3 items, a=.77) and learning for teaching (3 items, a=.68) contributed teacher’s sense of professional agency in the classroom interaction. In the professional community learning in professional community (4 items, a=.84), learning for collective responsibility (4 items, a=.84), learning for co-regulation (3 items, a=.75), learning as commitment (2 items, a=.64) and learning as problem solving (2 items, a=.73) were significant factors adopted by teachers for contributing and managing new learning in school community. The results confirmed that teachers’ professional agency is dependent on the task at hand and the working context. A key for teacher’s agency both in the classroom and in the professional community was co-regulation in terms of using others intentionally as a resource for learning and, equally, acting as a support for them. Hence, the co-regulative strategies in professional community adopted by teachers seem to be a significant determinant for constructing optimal learning environments in school.

Teaching and Teacher Education with Interactive Whiteboards

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Interactive whiteboards are increasingly available in schools. With the aim of planning how we can prepare teacher students for the use of Interactive Whiteboards in the classroom, we conducted an online questionnaire to investigate the current status of Interactive Whiteboards in German schools. Participants were N = 316 teachers (107 male, 199 female, 10 unspecified). Overall, the results of the online questionnaire show that teachers feel uncertain about using an Interactive Whiteboard in their classroom. Therefore, there is a need for training. As more technically skilled teachers used the Interactive Whiteboard more often, this training could also comprise general technical competencies.
Future studies should explore how exactly teachers can tap the full potential of this new technology. These findings should then lead to effective trainings for teachers and teacher students.

Learning the Language While Learning How to Teach in Foreign Language Teacher Education

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This paper presents results from a two-year qualitative study of pedagogical strategies to integrate language and language-teacher learning in two K-12 foreign language teaching methods courses at a large public university in the United States. In these courses, in which Arabic, Chinese, French, German, Japanese and Spanish majors were enrolled, teacher candidates engaged with curricular materials and with each other in the respective target language (TL). In-class activities adopted a content-based language learning approach to help teacher candidates extend their TL proficiency into pedagogical and professional domains associated with K-12 language teaching. My research focused on teacher candidates’ use of these TL materials, peer interaction in the TL, and the impact of both as they described it on their own learning. In this paper, I first ground the work in relevant scholarship on second language teacher education. Second, I describe the project and the specific context in which it was undertaken. Third, I outline the research design and my approach to analysis. Fourth, I elaborate three significant findings from the study. Finally, I discuss the implications of these findings and argue that such an integrated approach to language and language teacher learning provides opportunities that English-only language teacher preparation does not in better supporting novice teacher learning.

Measuring teacher professional behaviour in Australian early career teachers

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Teacher professionalism is widely endorsed as an important objective, yet few measures exist to accurately conceptualise teacher professional behaviour. The ‘Professional Interactions and Behaviours Scale’ (PIBS) was developed to assess the degree to which teachers have developed an understanding of appropriate professional interactions with students. The 20 item, four component scale was recently validated in a preservice secondary teacher sample (n= 197; Morris, Richardson & Watt, 2012). The present study aimed to confirm the multidimensional structure of the PIBS scale in 144 Australian early career secondary teachers. Unexpectedly, the 20 PIBS items were best represented by a 5 component model; termed hugging, sharing and caring, student befriending, external engagement and telecommunication (R2 = 61.91%; KMO = .76, Bartlett’s test of Sphericity $\chi^2 (190) =1226.92$, p

Teacher candidates’ characteristics and academic success: Is there a difference to other students?

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Psychosocial and cognitive profiles of future teachers starting their academic education are critical in the debate of suitability and qualification for the teaching profession. In this regard, the term ‘negative selection’ has been used among politicians and the public referring to the assumption that teacher candidates show less favorable cognitive and personal prerequisites compared to students of other degree programs. This, in turn, might predict less academic and occupational success among (future) teachers. The present study examined cognitive and psychosocial characteristics of teacher candidates compared to students of other degree programs as well as their academic success. Furthermore, we investigate whether academic success of teachers can be differentially predicted by specific characteristics. Data were provided by the TOSCA study, following a representative sample of students from the end of secondary school throughout university training and working life. Drawing on data of over 2000 students, the results showed that teacher candidates’ cognitive and psychosocial characteristics as well as their academic success do not differ from the characteristics and the success of students of other degree programs. Additionally, there are no specific predictors for teacher candidates’ academic success compared to other students.

Classroom Behaviours of Teachers: Predictors and Moderators

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Literature outlines that many countries are in the midst of educational reform, which revolve around the changes in the curriculum and teachers’ classroom behaviours (Sandt, 2007). This study had its focus on teachers’ classroom practices/behaviours and the factors which act as their significant predictors. Teacher self-efficacy, the confidence teachers hold about their individual capabilities to influence student learning, is considered one of the key motivation beliefs influencing teachers’ professional behaviours and student learning. Although literature is highlighting self-efficacy as a strong predictor of classroom behaviours of teachers (Ross, 1998; Woolfolk Hoy, Hoy, & Davis, 2009), there is criticism on the uncertainty about using self-efficacy research in teacher education (Wheatley, 2005), as the mechanisms through which self-efficacy beliefs might influence teachers’ actions and decisions are not investigated in detail. This study addressed the above mentioned space in the literature, by attempting to interpret these unexplored mechanisms in terms of different goal orientations of teachers, and analysing how these goals influence the predicted relationships between teachers’ self-efficacy and their behaviours in the classroom, using Expectancy-Value theoretical framework. Results are drawn from Australian school teachers (n=257) using a combination of established scales. The quantitative methodology of structural equation modelling illustrated the association among the different dimensions of teachers’ self-efficacy, goal orientations, and classroom behaviours. This paper reports partial findings from the study.
Professional vision in the context of science lessons in primary school

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Professional vision is considered to be a central component of teaching expertise. It includes the ability to notice and interpret significant classroom situations. Research findings show that expert teachers have higher abilities in professional vision than novice teachers. Moreover, there is initial evidence that professional vision relates to teachers’ professional knowledge and to students’ learning. However, little is known about how this ability develops and how it can be supported. Moreover, there are only few studies focusing on professional vision in the context of (primary) science education. This paper presents results from a primary science research study which aimed at developing a video-based instrument in order to investigate differences between in-service and pre-service teachers’ professional vision as well as the dimensionality of the theoretical construct. The instrument assesses professional vision with regard to the support of learning primary science, including the two dimensions cognitive activation and structuring. A pilot study (N=235) and a main study (N=434) with in-service teachers, Masters’ level teacher students and undergraduate teacher students were conducted. The validity of the instrument was confirmed using structural equation modeling. Moreover, systematic differences between the three teacher groups indicate criterion validity. High correlations between the two dimensions of professional vision (cognitive activation and structuring) suggest a one-dimensional construct. The developed instrument will be used in future research which focuses on the relationship between professional vision and professional knowledge as well as the development of professional vision in teacher education and ways to support it.

The role of explicit and implicit attitudes toward minorities in judgment and behavior

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Teacher judgments have an enormous impact on students' academic lives and the educational system as a whole. Research has shown that these judgments may often be systematically biased against minority students or those with immigration background. This is true for both experienced teachers and student teachers. The present study set out to measure student teachers' attitudes toward students with an immigration background using not only explicit but also implicit attitude measures as well as both achievement judgments and automatic behavior. We found no evidence for negative attitudes or biased behavior toward students with immigration background, though there was a relationship between implicit attitudes and automatic behavior. Explicit attitudes could not predict judgments. As a whole, this study suggests that student teachers may not be as affected by stereotypical expectations as previous research implies. This finding may be due to a true change in societal norms, or it may be the result of the methodology applied to discover bias. We argue that using both explicit and implicit measures allows for a broader exploration of the processes involved in producing (or avoiding) biases in the judgment of students.

Talking about thinking: developing teacher reflection in a learning community using classroom videos

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There is a well-known claim that in-service teacher education programs lack a model of how teachers learn. Hence, they often end up offering one-shot courses that are disconnected from teachers’ actual needs and practices, obtaining poor results. We claim that a relevant learning goal for in-service teachers is to foster their reflection about their own practice. This involves both focusing on important aspects of classroom dynamics and developing insights about the instructional decisions they make. In this paper we present the development of teacher reflection as exhibited by a group of Chilean teachers working in 5th to 8th grades in public schools. They participated in a yearlong professional development program consisting in a community of learners formed by 7 teachers and 2
researchers. The group met monthly to analyse classroom videos from their practice as well as videos from an online video repository of good teaching practices. The meetings were video recorded and we conducted a content analysis to collect evidence of individual and group reflection. Results show an overall increase of individual metacognitive statements related to their colleagues’ and their own practices. In addition, the quality of the group’s reflective process improved in terms of focus, depth and symmetry in the regulation of the reflective dialogue among researchers and participants.

Social media competence of pupils, parents and teachers - new challenges for media education

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Media competence is a civic skill. Teachers, parents and pupils in secondary school use social media in different ways. There is a significant gap in social media utilisation between young people and adults. A review of recent studies in social media reveals many reasons for this gap, including differences in technical skills, social media consumption, production of social media text and time spent on social media. This study shows differences between genders and generations in social media competence, interest in social media content, experience of use and social media content produced. Critical understanding and creative social media production are seldom part of formal learning in schools. The aim of this research is to clarify the social media competence of secondary school pupils (n=396), parents (n=120) and teachers (n=62) in five municipalities in Lapland, Finland:

What kinds of technical skills, critical understanding and communicative abilities do participants possess with respect to social media? Responses to an online questionnaire are analyzed using quantitative and qualitative methods. Results reveal that 90% of pupils use the Internet daily, but that there are different categories of users, including pupils with advanced social media skills and pupils who do not have a computer at home. To reach equality of social media education and to develop social media-competent teachers, social media education should play a more significant role in teacher education in Finland. KEYWORDS: Social media competence, critical media education, informal education

Teacher interventions in small group work

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Research on classroom talk and dialogue has typically focused on either teacher-led whole-class, or student-led small group discussions. This presentation focuses on teachers’ interventions in students’ small group activity. It is based on findings of the epiSTEMe project (Effecting Principled Improvement in STEM Education), a major study involving a research-based pedagogic intervention in English Year 7 (11-12 year olds) science and mathematics classrooms in 26 English schools, with a particular focus on dialogic teaching in both whole-class and small group settings. Despite a growing body of literature on dialogic teaching, some of its aspects, such as how teachers should intervene when students struggle with collaborative learning - remain relatively underspecified. Moreover, achieving high quality discussions in student-led small group work is seen as challenging by teachers. Through a sociocultural discourse analysis of data from 15 epiSTEMe classrooms, we look at the interface between teacher-led and student-led interactions and ask when, why and in what ways the teachers intervene during small group work and how teachers’ interactions with groups can enable
and support high quality student contributions and discussions. We examine closely the range and functions of teacher interventions and discuss their effects on student actions and learning. These findings will be related to the literature on, and implementation of, group-based learning and the sociocultural theory of education.

Question Asking in Large Lectures

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Question Asking in Large Lectures Vera Gehlen-Baum & Armin Weinberger Question asking by both, lecturers and students has been considered an approach to facilitate active participation and higher order thinking in large lectures. Based on school research, teachers ask more questions than students. Moreover, the quality of student questions is suboptimal. The present study analyzed the questions asked during 21 lectures regarding quantity as well as quality. Results indicate that lecturers do not only ask more, but also higher quality questions during a lecture. Students seem to ask questions to cover facts they need to understand the lecture’s topic, but not questions that are related to higher order thinking about the lecture content.

Conceptions of Coherence: The optimization of practice in one San Diego mathematics classroom

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Mathematics instruction has frequently failed to present mathematics as a coherent body of knowledge with student learning outcomes shown to be a fragmented collection of minimally connected facts and procedures. The promotion of coherence in mathematics classrooms seems worthwhile, but coherence can take different forms: . Coherence of knowledge: The structural coherence inherent in mathematical knowledge performed as the connection of related concepts and of old knowledge to new knowledge. . Pedagogical coherence: Well-established sociomathematical norms and instructional practices understood by all participants. . Cultural coherence: Mathematical knowledge and its engendering classroom practices conform to a coherent set of cultural expectations. The combination of coherence of knowledge and pedagogical coherence is performed as a classroom narrative, in which the logic and connectedness of the instruction reflect the connectedness of the mathematical concepts in a form of curricular storyline that is perceived as coherent by the students. Such perceptions of coherence, we would argue, are also dependent on cultural conventions that transcend the classroom, but frame every aspect of its practices. Different conceptions of coherence foreground different aspects of classroom practice. As an example, we report our analysis of the management of instructional transitions in a year 8 mathematics class in San Diego (USA), identifying strategies used by the teacher to assist the students in making connections between classroom activities and the conceptual content and associated mathematical practices central to each activity. Student post-lesson interview data suggest a connection between such classroom coherence and the coherence of student-constructed mathematical narratives.
Innovative teaching practices: School leader and teacher beliefs in five Australian secondary schools

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This paper focuses on the research data collected in the qualitative phase of the Innovative Teaching and Learning (ITL) Research Project in Australia involving site visits to five NSW government High Schools in the Sydney and Hunter regions. Australia joined the global ITL research project in 2011, sponsored by the NSW Department of Education and Communities (NSW DEC) and Microsoft Partners in Learning (PiL) Australia. The paper provides an overview of the global study methods, use of ICT by teachers and students, and provides examples of innovative educational activity from across the state. The supports and impediments for this innovation are explored in terms of systemic and school-based vision, and the impact of leadership, instructional methods and school context. The importance of individual teacher dimensions is illuminated through interview analysis and learning task exposition. The global study was conducted across five other countries including Finland, England, Russia, Mexico, and Senegal. As such the Australian results will be positioned in the global context.

Educational games in science education: Effects of incentives on students’ engagement and learning

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This study reports the effect of extrinsic incentives on engagement and learning in the Quest Atlantis multi-user virtual learning environment. Incentives referred to whether or not students were able to publically display their success, via a physical leader board and virtual badges that they could place on their in-game avatar. Students in two fifth-grade classrooms who were offered incentives were compared to students in two well-matched classrooms who were presented with intrinsic motivators. All 106 students completed a 15-hour ecological sciences curriculum that was rich with
feedback and opportunities to improve, which was expected to mitigate make any predicted negative effects of incentives and associated competitiveness. Evidence of engagement and learning were gathered at three ‘levels.’ Concerning engagement, students in the incentive condition showed no significant differences in engagement in written interaction (‘close’), self-reported situational interest (‘proximal’) or self-reported personal interest (‘distal’). In relation to learning, students in the incentive condition showed significantly larger gains in conceptual understanding (proximal), and non-significantly larger gains in achievement (distal). These results suggest that long-standing concerns about extrinsic incentives may be addressed or even reversed in this newest generation of learning environments, while this study provides a model for searching for such consequences and potentially addressing them if they are identified.

**Explaining differences in subjective and objective benefits of face-to-face vs online instruction**

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Scholars from different disciplines focused on the effectiveness and efficiency of online learning environments, as compared with traditional face-to-face approaches. Natural experiments within contexts of secondary education are only rarely the subject of these studies. This paper reports findings of a repeated two-group factorial experiment with one hundred and thirty pupils in a mid-sized school with the intention to scrutinize crucial determinants and moderators for subjective and objective benefits of two instruction modes. The design of the study incorporates constructs of the DeLone and McLean Model, an information system-oriented approach that focuses on identifying multi-dimensional information systems’ success factors, extended with variables related to perceptions of enjoyment. Partial least square path modeling was applied to scrutinize the factors affecting the differences in test results (objective benefits) between face-to-face and online instruction, as well as the perceived advantages of the employed e-learning system (subjective benefits). In contrast to previous research outcomes, pupils’ performance in the e-learning condition are significantly poorer compared to the results of the face-to-face instruction. The results further show the dominant position of perceived enjoyment as determinant for several constructs. By examining the impact of both system and individual antecedents on learning performance differences in a robust experimental design, using two indicators of net benefits into one research model, we contribute to the knowledge base on critical success factors for e-learning use. Implications for school practice, as well as further studies will be discussed.

**MICTIVO: Monitoring ICT integration in Flemish Education. Theoretical background and set-up**

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Parallel with ICT-investments, governments set up monitoring programs to evaluate the return on investment and effects of ICT on educational practice. MICTIVO aims to monitor the ICT-integration in the Flemish education system. ICT-integration in MICTIVO is a combination of ICT-infrastructure, ICT-policy and ICT-use at the micro-level, in which three actors are involved: headmasters, teachers and students with their characteristics, ICT-competences and perceptions towards ICT. MICTIVO is devised as a recurrent instrument with room for additional indicators to assess the latest trends (e.g. social media use). During the first edition (2007-2008), scales were validated and empirically tested, and the second edition (2012-2013) is a follow-up study. Design principles were ensuring comparability (over time, between actors, between indicators) and avoiding redundancy. To get a representative view on the Flemish education system, 20% of the schools are selected through stratified random sampling. The selected schools are allocated to one of three sub studies. In the first, only headmasters are questioned (80% of the sample), in the second also all the teachers per school (10%) and in the third also several classes of students per school (10%). This will allow to run multilevel analyses. The strengths of MICTIVO are that we will get a representative view on the status of ICT-integration in Flanders, based on scales that were validated in the population and with strong psychometric properties.

Who's teaching me? Studying two Deaf students transitions from secondary schooling to universities

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Students who need particular educational supports attend mainstream Portuguese schools for more than two decades, particularly since the Salamanca Statement (UNESCO, 1994). But these students still face many barriers in their access to school achievement and social inclusion (Borges, 2009) and are one of the smallest groups attending the University of Lisbon, much less than blind students (Almeida, 2009). Their communicational characteristics shape their learning experiences (Sim-Sim, 2005). Teachers and other educational agents are expected to enable transitions between the different cultures in which students participate (Zittoun, 2006), facilitating
communication and meaningful learning (Bakhtin, 1929/1981). We focus on two Deaf students’ life trajectories of participation (Cícser, in press) when moving from secondary schooling into universities. Assuming an interpretative approach (Denzin, 2002), we developed two intrinsic case studies (Stake, 1995). Participants are these two Deaf students, their mathematics, special education teachers and mothers, psychologists, classmates, and friends. Data collecting instruments were interviews, observation, informal conversations, students’ protocols and documents. Data treatment and analysis was a narrative content analysis (Clandinin & Connelly, 1998) from which inductive categories emerged (Cícser, 2009). Results illuminate a gap between the adaptations and support given to these Deaf students during secondary schooling and those in universities. In their secondary school we observed measures adequate to promote inclusion. In universities the barriers to communication and the lack of equity of learning opportunities are sound, making their access to school achievement much more difficult as illuminated by the discussed examples.

**Changing practices for an effective teaching and a sustainable learning: The first week of classes**

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Many students face school underachievement and rejection in mathematics. Several authors claim for the need of changing teachers’ practices, stressing the importance of collaborative work, agency, students’ empowerment and legitimate participation to promote a high quality education (Cícser, 2009; Cícser & Kumpulainen, 2009; Ligorio & Cícser, 2012). Changing the first week of classes is essential to achieve changes in practices. If only discourses change students tend to maintain their usual ways of acting and reacting (Cícser, 2009, 2012). Interaction and Knowledge (IK) was a research project developed through 12 years. Its main goals were to study and promote collaborative work in formal educational scenarios, contributing to an inclusive and intercultural education. To achieve them students’ engagement is essential. Teachers need to know students’ characteristics, needs and interests promoting their participation. We elaborated three instruments for the first week: a task inspired in projective techniques; a questionnaire; and an instrument to evaluate students’ abilities and competencies. The analysis of these instruments contributed to a responsible teaching and a sustainable learning. We assume an interpretative approach (Denzin, 2002) and an action-research design (Mason, 2002). The participants are 69 mathematics teacher/researchers, their students, psychologists and significant others. Data collecting instruments include those mentioned above and others from IK empirical corpus. Data treatment and analysis include a narrative content analysis (Clandinin & Connelly, 1998) from which inductive categories emerged. We discuss examples of students’ answers that illuminate the contributions of these data collecting instruments and practices to promote a responsible teaching and a sustainable learning.

**Young children’s representations of identities of high and low achievers in mathematics**

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In this paper we examine children’s representations of mathematical achiever identity. In the UK ‘ability setting’ in mathematics is a prevalent practice and one which some academics have argued, is detrimental for both high and low-achievers. We agree, and suggest that from a young age children develop particular meanings around mathematics achiever identities which can have a negative impact in light of institutional ‘ability setting’. A sociocultural perspective frames this work through the concept of mediation, which directly addresses the construction of meanings and identities of a learner, either through the role of ‘others’ or through self-identification. To explore the representations of achiever identities in very young children (6/7 years and 10/11 years) we developed a ‘child identity task’ using a story completion technique. The child is asked to produce a story, containing specific prompts provided by the interviewer, which in this case focused on a boy/girl who was a high-achiever or low-achiever in mathematics. The children were asked to comment on the characters thoughts and feelings about mathematics. Twenty-seven children from two different schools participated. Of these, only one group of year-2 children were not put into ‘ability sets’. Findings from the identity task show the complexity of children’s representations of low and high-achiever in mathematics. On the surface the high-achiever likes mathematics more than the low-achiever. However, common to both characters were feelings of fear, speed of processing difficulties or boredom. Relationships with others (friends, parents, teachers) could be particularly fraught for the low-achiever at home and school.

Creative art-based projects in culturally diverse settings: toward a sensitive evaluation

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Intercultural art education has recently growth as a multidisciplinary field for the promotion of new pedagogical practices on the subject of cultural differences. Accordingly, art intercultural projects including music, drama and other art forms have been widely promoted both in and out schools. Nevertheless, even though these projects are now popular as educational practices, we still lack a systematic analysis of the quality and the outcomes they achieve. The paper aims to contribute filling this gap, focusing on creative art-based projects addressed to the children aged from 10 to 14. We describes two integrated lines of research aiming to build a list of quality indicators concerning art projects in intercultural education, and to develop the Children Intercultural Sensitivity Inventory to assess the projects’ efficacy.

SimSketch - Drawing-based Modelling in Science Education

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Particularly in early education, drawings and sketches are an established and adequate means to create self-constructed external representations of scientific phenomena. They can positively influence reasoning processes in different ways, e.g. by disambiguating learners’ mental model, by reducing working memory load and by providing a basis for (self-) explanations. Since drawings are not bound to a formal syntax, they can be applied to many different phenomena and domains, such as depicting the movement of objects in physics or the spreading of a disease in biology. Today, the
usefulness and impact of self-created drawings can be increased by utilizing computer-supported drawing tools and pen-based input devices, e.g. by supporting the learner with awareness information and feedback, by sharing drawings with peers, or by using a learner-created drawing to create a working model. In this contribution, we demonstrate our approach to create working models based on drawings: Our software SimSketch allows learners to externalises their mental model by creating a computer-supported drawings of phenomena, which are then augmented with instructions about the expected behaviour. SimSketch creates an executable multi-agent simulation from the learners’ specifications, thus providing feedback and promoting critical involvement and reflection on the phenomena at hand.

**Down With Food: An iPad Game that Addresses Science Misconceptions**

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Down With Food is an iPad game that addresses upper elementary school children’s misconceptions about what happens to food after they eat. Children typically have a simplified understanding of digestion: food enters your mouth, goes down your throat, enters your stomach, and digestion is completed in a linear fashion. In order to better understand this process, children must first develop an intuitive conception of causation within and between systems—a capability that involves understanding spatially and temporally localized causes, direct, linear, and instantaneous connections between cause and effect, and centralized agency. In order to address these concerns, we have developed a game that integrates theories of motivation that aids learners in developing a more complete understanding of the digestive system by addressing causal misconceptions. In our
game, the player begins by choosing one of the major organs of the gastrointestinal tract: mouth, esophagus, stomach, small intestine, or large intestine. Each organ brings the player to a mini game, which includes several levels of difficulty. Gameplay from one mini game influences gameplay in the next, allowing learners to understand the dynamic nature of the digestive system, thereby elucidating the mechanisms through which complex causality takes place. Our game was developed using design-based research, whereby children ages 6-to-12 iteratively test the game in an authentic context to help inform the design of the game to fit their motivational and cognitive needs.

**CouchCampus - a tool to assess web based learning in experimental settings**

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CouchCampus is a tool developed to conduct experiments in a computer-based learning environment. On the basis of the blog software wordpress it allows researchers to design empirical studies and administrate even huge numbers of participants. The tool basically offers four features: a) designing multimedia learning experiments - pre- and post questionnaires and tests can be administrated as well as different learning environments, b) log-file extraction in a SPSS compatible file, the actions of users are stored in a server-based database and can be imported to SPSS easily, c) online generation of learning protocols of the user, the learning path of a user can be displayed while or immediately after working on the material and therefore can be used for cued retrospective reporting and d) the poor man’s eye-tracker feature, offers the possibility to mask text, which can be made visible by the learner using the mouse. The CouchCampus tool is seen as an example of how enhancements of open source programs can support research in educational sciences.

**Effectiveness of PhD-programs**

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A PhD-program is an efficient setting for knowledge acquisition, knowledge presentation and the work on own research questions. In this context the development of content knowledge and methodological skills are necessary as well as the development of self-esteem, social competence and leadership ability. English language skills are a further assumption for a successful scientific career, in order to publish cross-country and to be capable of integrating the students into an international scientific community. In the last years the doctoral apprenticeship not only changes in German. In Germany individual promotions are often discarded. Currently the amount of doctoral students in graduate programs increases. The form of promotions turns from a monograph to a cumulative dissertation. It is surprising that in spite of structural and organizational changes, the competence development of the graduates with the new forms of promotions have been rarely studied. The graduate program offers the possibility to capture the skills across the entire period of promotion. After a year the outcomes show a significant gain of content knowledge, methodological skills and English abilities. Also the empirical findings illustrate a significant knowledge acquisition in
the subsets of the three skills. In particular the competence increase is forced by the active participation of the doctoral students in the program, although differences can be seen between the PhD-groups of the program - psychologists, sociologists, economists or teaching professions.

Measuring systems thinking: Evaluating a competence model and an intervention

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Environmental education research literature reveals that many studies aim at promoting students’ systems thinking. However, there is still a lack of interventions that are developed on a theoretical foundation. The present study investigates whether a theoretically derived competence model on systems thinking is a suitable basis for intervention and test development. Within the research project SYSDENA (systems thinking concerning nature as part of a sustainable development), a test was developed on the basis of the competence model to measure systems thinking. The test was applied to evaluate a newly created intervention for systems thinking in the field of the ecological system ‘forest’. Empirical data support the assumed competence model. Results also support that the intervention is effective for enhancing systems thinking.

Relationship between values of a test and learning strategies

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This study investigated the relationship between values of a test, learning strategies used in learning for and reviewing a test. In addition, we used test approach-avoidance tendency as a mediator variable because motivation for taking a test promotes effective learning strategies. Furthermore, we employed competence as a moderator variable for evaluating the above relationship because perceived competence is related to desirable outcomes such as high learning motivation or academic achievement. Data was collected from 493 high school students (254 males, 239 females) using a self-reported questionnaire. We assigned the students who exceeded the average competence score to a high-competence group and those who scored below average to a low-competence group. We then performed a multi-group covariance structure analysis using Amos 19.0 and used full information maximum likelihood for the missing data. Factor loadings, variance of error, variance of latent variables and covariances between latent variables were invariant between high- and low-competence groups. Thus, competence has no moderation effects. The results showed that strategies used for test preparation were related to those used for test reviews; therefore, teaching students strategies to learn for a test might foster effective post-test strategies. In addition, the results indicated that the test approach tendency promoted effective strategies and students who considered tests as effective means to improve their learning strategies and create a learning programme had a higher test approach tendency. Furthermore, values of a test exhibited a direct relationship with learning strategies.
Scientific reasoning: Modelling hierarchical levels of understanding

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Many models of scientific reasoning and its development posit distinct, hierarchical levels of naïve and intermediate understanding that children pass through before coming to more advanced conceptions of science and the scientific method (e.g., Carey Evans, Honda, Jay, & Unger, 1989). So far, testing these models has been difficult empirically due to children’s low-frequent choices of intermediate conceptions in multiple-choice assessments. Defining the mastery of a given level not as the selection of the corresponding answer option (e.g., the advanced answer) but rather as a conjunction of the acceptance of the given level and the rejection of the preceding level (e.g., acceptance of the advanced answer and rejection of the intermediate level answer), we present data from a study with N=1353 third-graders who answered 23 multiple-select items that were adapted from a scientific reasoning test from the project Science-P. When children had to accept or reject each of the three levels individually, the theoretically claimed hierarchy of levels of understanding was confirmed. Furthermore, whereas both the rejection of naïve answers and the acceptance of advanced conceptions showed a significant relationship with children’s selection of the advanced answer, there was only a weak correlation for intermediate conceptions. This indicates the relative ease of choosing an adequate answer and the relative difficulty of rejecting lower level answers. These results have important implications for the design of assessments of scientific reasoning and science teaching in elementary school where stronger focus should be placed on facilitating children to overcome inferior levels of understanding.

Measuring Professional Vision: Validation of the Extended Video-based Tool ‘Observer’

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The study validates an extended version of the instrument Observer, an online-based tool to assess pre-service teachers’ professional vision on principles of teaching and learning. The tool includes video clips of authentic classroom situations in various domains and phases of instruction. Participants (pre-service teachers) rate the video clips with regard to describing, explaining and predicting teaching and learning as shown in the clips. Their ratings are compared with those of experts. First, the usability of the tool was tested in a video-based pilot-study by means of the think-aloud method (N = 10). Second the scaling of the items was tested with additional N = 200 participants. The results show that these clips have the potential to stimulate learners when it comes to draw valid conclusions about various classroom situations.

Executive functioning is one of the most studied constructs in several adult and childhood disorders. However, its study is far to be easy, being necessary developing valid and reliable assessment tools. In this sense, the use of behavior rating inventories could provide useful information about behaviors related to executive functioning problems, letting us to design more ecologically adjusted interventions. However, there is not any tool which meets these features in Spanish language, specifically if we focus on school ages. In this context, the main goal of this study is to present the psychometric properties of a new executive functioning rating scale developed to assess children and adolescents through the information provided by families, being the first one completely made for and validated in Spanish population. Psychometric properties were analyzed in a normative sample of 1,236 participants, (aged 7 to 16), obtaining these results: a) exploratory and confirmatory factorial analysis suggested a model with 9 factors as the best fits the data, being model fit indexes the following: CMIN/DF = 3.497; GFI=.945; CFI=.951; RMSEA=.045 (LO 90=.042, HI 90=.048, PCLOSE=.996); b) a very high reliability was found for the total scale (Cronbachs Alpha=.937), ranging from .616 up to .744 among factors. These results highlight about the potential utility of this tool for
assessing executive functioning and its components. Additional studies, with other versions of the scale (teachers and self-report forms) are being done in order to delimitate its final usefulness. Keywords: executive functioning, factorial analysis, reliability, behavior rating inventory, family.

Exploring patterns of childcare for Australian children

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Increasing numbers of Australian children are accessing childcare arrangements (Australian Bureau of Statistics, 2008). Variations in type of care, hours in care, number of concurrent care arrangements and stability of care lead to diverse care experiences for children. Longitudinal tracking of these childcare experiences for Australian infants from birth until formal schooling has not yet been undertaken. This poster presents preliminary data from a longitudinal study which will examine the relationships between care arrangements and child outcomes for a nationally representative sample of Australian children. It is proposed that child care experience will have differential effects on child outcomes depending on the patterns of and quality of care.

Self-Construals and Individualism/Collectivism Mediate Country Effects on Goals and Emotions

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The present study examined cross-cultural differences in independent/interdependent self-construals and individualism/collectivism among high school students in Germany and South Korea. We also examined whether self-construals and individualism/collectivism mediate the relationships between 1) country and achievement goals, and 2) country and achievement emotions. Students from Germany (N=200; age 14 to 18 years) and Korea (N=228; age 15 to 18 years) completed the Self-Construal Scale, the Individualism-Collectivism Scale, the Achievement Goals Questionnaire-Revised, and the Achievement Emotions Questionnaire-Language. Among the cultural variables, independent/interdependent self-construals and vertical individualism were documented as mediators of the relations between country and achievement goals, and country and emotions. Specifically, independent self-construal mediated the country effects on approach goals, positive emotions (enjoyment/hope/pride), and negative emotions (anxiety/hopelessness), while interdependent self-construal mediated the country effects on both approach and avoidance goals, positive emotion (enjoyment), and negative emotions (hopelessness/boredom). Among variables of individualism/collectivism, only vertical individualism was a mediator of the country effects on approach and avoidance goals and on positive emotions (hope/pride).

How much deregulation does the autonomous school need? Empirical evidence from Cyprus

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Although policy makers strengthen and underline the necessity of ‘deregulation’, discussions about deregulation versus regulation in Europe still seem to be characterized by a lack of sophistication and complexity and require a more differentiated picture of the degree and the forms of deregulation. Fostering deregulation, for example, may result in a process which ends up at the opposite, in more hierarchical structures and enhanced top-down control. Facing the reality of policy making, pure transfer of either top down polices or bottom up models has proven to be obsolete; these strategies are more and more replaced by a governance mix of regulation and deregulation patterns. As a consequence, the analysis of new educational governance approaches should consider the local actor’s interpretation of new roles and new responsibilities. Relating actions and reactions of school leaders to the legal and formal environment they are working in should lead to more contextual and realistic patterns of responsiveness. In this paper we investigate - on the individual level of school leaders - whether school autonomy needs deregulation, or regulation towards autonomy, respectively. We find that the autonomy school leaders experience it is not necessarily related to a ‘defined’ degree of autonomy which is prescribed by educational law and driven by concepts of new public management. Their ‘perceived’ autonomy is also due to factors which can be located at a rather personal level. Hence, our findings provide insight into principals’ motives to adopt certain styles of leading schools, quite independently from new measures of educational governance.

Uncovering Dutch history teachers’ Pedagogical Content Knowledge

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Uncovering Dutch history teachers’ Pedagogical Content Knowledge within the context of curriculum innovation

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Summary
In this research the concept of Pedagogical Content Knowledge (PCK) is used to describe and analyze the knowledge development of experienced history teachers. PCK refers to the knowledge that teachers use to make subject content available to students. It relates also to the knowledge of the understanding of the students and knowledge of curriculum and assessment (Shulman, 1987). Dutch history teachers are currently facing radical changes within the history curriculum in upper secondary education (Wilschut, 2012). As a result of this innovation history teachers have to conceive new historical knowledge, restructure their way of teaching and implement the new curriculum. In a first survey of 2009, 137 teachers answered questions about the new curriculum and the difficulties with this task. So the history teachers have to restructure their PCK and this process of knowledge development will be examined in depth. In this poster presentation we will discuss in what way the PCK (development) of history teachers can be captured and described. Twenty teachers are selected. They have been teaching upper secondary students at the same school for six years or longer. PCK has been a subject of research in science since the 1980’s. Henze, Van Driel and Verloop (2008) developed a format for a semi structured interview and Loughran, Berry and Mulhall (2006) developed a PCK-format related to subject content and instructional strategies. We combined and adapted these instruments and also added other instruments. In our poster presentation the developed instruments will be discussed.

When learning at school makes sense no matter the social origin: the case of young women from Kosovo

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Since the sixties, one of the main arguments to explain the school failure of children from low social classes is the one developed by Bourdieu and Passeron (1970) according to which school practices are understood only by children who share the social norms and representations of the dominant class. This argument is still considered as relevant in recent studies interested in school failure of immigrants’ children (Becker, J&xB; pel, and Beck, 2011; Hutmacher, 1995). Adopting a sociocultural psychological perspective on thinking and learning (Valsiner, 2007), this poster focuses on a case which does not correspond to such explanations. Indeed some young women from Kosovo in Switzerland achieved higher education despite their social origin. The study is based on secondary analysis of educational data, and on interviews and a written text with sixteen young women. Qualitative methods - cases studies (Rosenthal, 2007) and thematic transversal analysis (Flick, 2006) - were used to analyze data collected through interviews and written texts. The analysis suggest that psychosocial and symbolic resources used by the participants and the meaning they conferred to
knowledge acquired at school and in their own community contribute more than their social origin to understand learning dynamics. This invites us to think about the possibilities schools and teachers have to create activities which can be meaningful to children. It also encourages us to perceive students as having potential resources on which they rely on and which could be used by school to sustain children’s identity as learners.

**Rethinking School: How to Promote Education for Sustainable Development**

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Economic and political crises are clearly indicating that economic growth is not without limits. The complexity and demanding nature of issues dealt with in the modern society have increased the need for flexible and adaptable problem solving strategies, guided by ethics and wisdom, in order to care for common good and to attain sustainable development. Sustainable development is an important goal of education. United Nations have thus proclaimed a decade (between 2005 and 2014) of education for sustainable development (UNESCO, ‘Education for Sustainable Development: United Nations Decade (2005-2014)’, Paris, 2005). Sustainable development should by far exceed only humanity’s relations with the environment, what is usually subsumed under this term, but encompass also the development of awareness of and humane attitudes towards issues like global poverty, social inclusion, justice, human rights, and similarly. Thus education can contribute towards sustainable development not only with the study of scientific disciplines related with the environment and negative influences of past and current development, but also by a change of education paradigm, based on critical thinking, self-reflection and skills for creative life, which i.a. enable humanity to cope with the challenges of sustainable development (Curren, 2009). The aim of this contribution is to outline some suggestions for education framework of teaching / learning for the sustainable development, based on scientific theories, models and findings in the areas of critical thinking, socio-cultural approaches to teaching / learning (communities of learning), and mind, brain and education (MBE) science.

**Student Perceptions of Cognitive Efficiency: Implications for Instruction**

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This study used a phenomenological approach with content analysis to create a model of how students’ perceive cognitive efficiency (CE), which is generally described as increases in the rate, amount, or conceptual clarity of knowledge, versus cognitive costs needed to attain knowledge. Graduate education students completed a five-item open-ended survey to measure perceptions of CE and what factors they believed enhanced or inhibited CE. Analysis of results revealed that student perceptions of CE predominantly focused on malleable aspects of self-regulated and reflective cognition, aligning with many descriptions of expert teaching. Students described a diminished emphasis on knowledge acquisition and information processing, in contrast to views typically associated with CE in instructional and psychological research (Authors, 2010; van Gog & Paas, 2008). Practical teaching and learning implications, including suggestions for instructional practice and future research are presented.

**Supporting self-regulated learning: The effect of implementation intentions in vocational education**

Stephanie Hiltmann
The present field study focuses on the support of self-regulated learning of vocational students (N=214). It is argued, that the development of learning goals and their attainment through implementation intentions support learners to persist in studying and to improve learning. Within an experimental research design it is investigated whether goal setting and implementation intentions influence learning behaviour positively. The sample was instructed to set a personally high valued learning goal, which can be achieved in six weeks. The experimental group additionally split the main goal into weekly sub-goals and form implementation intention. Thus they plan when, where and how to attain the sub-goals. Furthermore the participants of the experimental group form distraction-inhibiting implementation intentions which are based on behavioural and motivational regulation strategies. Thereby it is described, how to handle learning problems of volitional, motivational or cognitive manner so that they do not impede studying. The main assumptions includes (a) the enhancement of the level of goal attainment, (b) enabling the application of cognitive and meta-cognitive learning strategies, (c) raising study time, and (d) handling learning problems in an efficient way through special training with goal setting, forming implementation intention and distraction-inhibiting implementation intentions. Preliminary results show influences of the experimental design and significant moderator variables.

Navigational behavior of students while solving digital reading tasks

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Electronic reading is increasingly important in daily life. Users of electronic media need to search for the relevant information and have to use tools in order to navigate in electronic information spaces. Hence identifying sources of difficulties in electronic reading is a relevant base for curriculum development including teaching of electronic reading competences at school and further education and also for the design of digital texts. The PISA 2009 study offers the opportunity for research on electronic reading because an electronic reading assessment has been realized. During this assessment process log-file data have been recorded for every participant, which allow detailed analysis on various indices concerning navigational behavior such as processing time. Outcomes of this study involve the specification and description of task related indices that influence the electronic reading competency. Indices concerning the task related requirements are analyzed to
identify which of them permit to predict the best the difficulty of the tasks. The analysis will focus on students' navigational behavior and task performance.

**General cognitive competence for problem-solving and 1st degree algebraic equations problem-solving**

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There is evidence of a relationship between general cognitive competence for problem solving (GCCPS) and performance in specific problem-solving (Chi, 2011). GCCPS can be defined as an individual’s capacity to engage in understanding a problem and solving it. Little research has been done into the relationship between GCCPS and the capacity to solve 1st degree algebraic equations. In this study, 38 subjects aged between 12 and 15 years, attending the 8th year in a public school were divided into two groups: high and low GCCPS, according to their scores obtained in a test designed to measure GCCPS (WASI). These students were asked to solve 1st degree algebraic equations. Based on the results from this task, we investigated whether this GCCPS could be applied to the specific ability to solve problems involving 1st degree algebraic equations, as well as differences in performance between the groups. Pearson’s correlation showed a significant correlation (p

**Graphs are used extensively in science classrooms or are they?**

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Carolyn Haslam  
The University of Auckland  
New Zealand

Normal 0 false false false MicrosoftInternetExplorer4 Graphs are tools that scientists use extensively to communicate to other scientists and the public. Graphing is an important skill that students studying science need to know but one that they find difficult. This presentation will summarise the results of three studies on graphing: a) an analysis of the prevalence of graphing content in NZ textbooks, b) an analysis of the prevalence of graphing questions on National exams, and, c) an analysis of classroom coverage of graphing in science in Years 9-11 in NZ. Findings indicate that graphing is considered a difficult but important skill by teachers but is not extensively taught at the secondary level.

**Perceptions and reflections in word problem solving**

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Javier Rosales Pardo  
Universidad de Salamanca
Research on educational intervention in word problem solving has showed how teachers often organize their work in the classroom with more emphasis on mathematical aspects of the task than on situational aspects. In this paper we attempt to describe some of the reasons why teachers behave in this way. The participants were 22 teachers (11 in-service and 11 student teachers) asked to solve the experimental task. The participants had to evaluate three different situations (two different problems, two proposals for solving problems and two teacher-students interactions). Significant differences between in-service teachers and student teachers were found in all tasks. These results support the idea that in-service teachers were more superficial because they considered information for reasoning as irrelevant, while student teachers were more oriented for reasoning.

**Teachers’ self-perceptions of knowledge and pedagogical practices related to reading comprehension**

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Robyn Gillies  
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Australia

Eileen Honan  
The University of Queensland  
Australia

Karen Moni  
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David Brereton  
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Australia

This study was conducted with classroom teachers and specialist teachers who support literacy learning in schools in Queensland, Australia and who were participating in a larger research project. Fifty-two teachers and eighteen specialist teachers (e.g., Support Teachers (Literacy and Numeracy)) in 11 participating schools completed the Teacher Survey: Teaching of Reading Comprehension or its parallel version for Support Teachers. The findings for the common items on the two Surveys...
indicated that while both groups of teachers believed they were knowledgeable about reading comprehension and reading comprehension strategies, they believed they were less knowledgeable about the pedagogical practices used to teach reading comprehension and reading comprehension strategies. Furthermore the specialist teachers did not reveal higher levels of knowledge about pedagogical practices related to reading comprehension. While the sample sizes are small, these preliminary findings indicate that both groups of teachers warrant ongoing professional development related to pedagogical practices for the teaching of reading comprehension.

Phenomenographic Study about the College Graduates’ Conception of the Work Place

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To know the variation of the college graduates’ work life we use the phenomenography and variation theory to describe their work experience. Our research question is how the variation of their working activities of the college graduates in early stage of their career. As a result of our interview, we discerned five categories which describe college graduates’ conception of their effective working activities. In addition, these categories have variations among the industries, type of a job, and the elapsed year after the graduation. The findings from the phenomenography could be used to improve the Japanese vocational education.

Epistemological beliefs of early childhood teachers and their relationship to professional action

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The study explores the influence of early childhood teachers’ epistemological beliefs and their beliefs about children’s learning on their professional action. These beliefs have already been outlined as important factors affecting the teaching-learning processes (Hofer & Pintrich, 1997). In this project, we investigate domain-specific (domains: early childhood educational science and natural science) and cross-domain epistemological beliefs of early childhood teachers as an aspect of professional knowledge. By using a set of different questionnaires and observing professional action of early childhood teachers, we aim to investigate the effect of epistemological beliefs on the quality of their professional interactions. In our first qualitative study, semi-structured interviews were used based on everyday-controversies and analyzed with the approach of the content analysis (see Mayring
2010). The results of our interview study confirm the domain specificity of epistemological beliefs as proposed by Hofer (2000). Indeed, our first findings showed that there is a difference between the profiles of these domains. In addition, based on the work of Brownlee et al. (2008), we found that there are three main profiles of epistemological beliefs: subjective-/objective-oriented, practice-based and evidence-based. We will consider these findings as a basis for constructing our questionnaires. Studying the structure and the influence of the epistemological beliefs on professional action will provide evidence about the importance of these beliefs for the quality of early childhood teacher-child interactions.

Do American College Professors Indoctrinate Students in Political Liberalism?

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United States

The potential of American universities and colleges to liberalize students has been the subject of steady debate since Newcomb’s classic study at Bennington (1943), which demonstrated that higher education acts as a liberalizing force on students’ political attitudes. Following the Bennington study, research on this topic has yielded mixed results. To help regularize this literature, the current study proposed and tested the academic reinforcement hypothesis, which suggests that students self-select into a major based on their initial political attitudes. Over the course of college exposure, students’ attitudes are reinforced in the direction of the dominant political norms in academic majors. Sixteen professors (10 political science, 6 psychology) and 124 students (72 political science, 52 psychology) completed measures of their political attitudes at a private liberal arts college in Southern California, USA. Students reported their political attitudes and their perceptions of academic social influence at two points in time (one year apart). Results supported the academic reinforcement hypothesis and also showed that students may experience psychological reactance in reaction to pressure to change their political attitudes. Implications of these results for higher education will be discussed.

The effect of trainers’ beliefs on prematurely apprenticeship contract terminations

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In Switzerland the VET-system is organized in a ‘Dual System’, where the apprentices have an apprenticeship contract with the companies. Each year up to 25% of those contracts are terminated prematurely, which is related to high costs for society, the company, and the young people. The existing studies indicate that the reasons for premature contract terminations (PCT) are normally based on various, cumulating factors. Most of these studies focus on the characteristics of the trainees, whereas the role of the trainers has received only little attention. However some studies give empirical hints that the professional behaviour of the trainers plays an important role on dropouts. The professionalism of trainers can be conceptualized as a multidimensional model of components like content knowledge, motivation, values, attitudes and beliefs. The aim of this paper
is to examine the trainers’ beliefs regarding teaching and learning in training company and to analyse the relationship between these and PCT. The assumption is that the beliefs of a trainer have an impact on his/her behaviour, which determinates the training quality and has therefore an impact on PCT. The representative sample of this cross-sectional study consists of 800 training companies for cooks and for painters from the German-speaking part of Switzerland, 400 of which with and 400 without PCT in the recent past. Surveys based on half-standardized questionnaires are conducted with trainers and trainees.

**Teachers’ beliefs about gender differences and their responsibilities**

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In this poster I will present the results of a survey asking teachers participating in a mathematics and science project about their beliefs about gender differences in student achievement and attitudes and their responsibility in addressing them. 164 teachers (28 elementary school, 136 secondary school) participated in the study. 10% of the teachers see schools responsible for the found gender differences, most deem society (education, media, parents etc.) as most important, many report also that they ‘can’t explain’. The poster presents the findings on various questions and proposes consequences for CPD courses.

**Teaching students to recognize filmic devices in propaganda movies**

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Because videos can be a powerful tool of propaganda, awareness of filmic devices used to influence the recipients’ perception of audiovisual information should be a central component of media literacy. However, research has shown that many recipients do not possess the necessary skills to critically analyze videos with regards to the use of filmic devices, even after being presented with theoretical information about these devices and engaging in a design task with another video document in dyads (Zahn, Pea, Hesse, & Rosen, 2010). However, observing a video for the use of filmic devices while at the same time trying to interpret these devices may result in cognitive overload. Therefore, the current study will implement cognitive cues in the form of small symbols that guide the recipients’ attention to the filmic devices while the respective devices are used thus freeing up cognitive resources for the interpretation of the effects of these devices. Eighty 9th graders from Bavarian grammar school will work through the experiment individually. After training about the use of filmic devices in propaganda, a propaganda movie will have to be analyzed with regards to the use of the filmic devices with half the students being supported by cognitive cues.
Afterwards, a transfer task will require the students to analyze several video excerpts without instructional support. It is expected that the combination of training and cognitive cues will result in superior results, whereas training or cueing alone will not have any positive effects on the students’ performance.

Reform in Science Education Standard in Japan from the Perspective of Learning Progressions

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Learning progressions (LPs) is a hypothetical model of how students’ ideas about scientific phenomena evolve under appropriate instructional interventions. In the last decade, researchers have conducted empirical and theoretical studies of LPs to design curriculum and lesson units (e.g., Duschl, Maenga, & Sezenb, 2011, for review). In this study, we examined how LPs is used to improve Japanese national standard as an example. LPs was found useful to evaluate the current state and consider modification. Furthermore, we examined the lesson study practice, Hypothesis-Experiment-Instruction (Hatano & Inagaki, 1991) to improve the national standard by integrating theoretical LPs models and practice-based evidence. Through our review of HEI lesson plans, we found that HEI lesson units could be assembled as LPs-based science education standard in which students pass a variety of trajectories toward acquisition of appropriate conceptual understanding. A large amount of data such as practice records by many teachers based on same HEI lesson plans could be valuable resource for researchers to validate learning progressions within and across lesson units.

Key features of a team instructional approach for enhanced large-class learning environments

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Post-secondary instructors are tasked with the responsibility of meeting their students’ dynamic pedagogical needs. This task is further complicated for instructors of large-classes environments (>75 students), because of the challenge of responding to a larger number of students compared with smaller classes (Mulryan-Kyne, 2010). With the aim of providing a high quality teaching and learning environment across multiple sections of large-class courses, a Team Instructional Approach (TIA) was developed. A TIA refers to the collaborative efforts of a course coordinator; several instructors and graduate teaching assistants involved in the planning, delivery, and assessment processes with a coordinated course. This poster presents a convergent-mixed methods study used to examine the impact of the TIA across 9 sections of a coordinated course during two terms (2011-12). A qualitative-dominant crossover mixed methods analysis integrated the findings from 3 data sources: an online post-course student surveys (n = 344), in-class observations (n = 90), and instructional team
meeting summaries (n = 16). The integrated analysis revealed students’ attributed their learning needs being consistently met to four key features of the TIA: instructional activities that were engaging, information that was consistent across multiple sources, formative feedback that was timely, and assessment scoring that was reliable. These findings provide evidence of a cost-effective and pedagogically sound instructional approach that begins to address the challenges identified within the post-secondary large-class learning environments.

Back to the routine? Teachers’ instructional changes after the completion of a reading intervention

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The successful implementation of promotional programs in the classroom always goes in line with changes in teachers’ instructional behavior, e.g. a more explicit teaching of strategies. Hence, as a crucial point for the long-term effectiveness of intervention programs we addressed the question whether teachers maintained instructional changes after completing a worked-out reading intervention. Therefore, three classroom observations were conducted before (time 1) and after (time 2) the implementation of a standardized reading program (‘Becoming a text-detective’) in the classrooms of 75 German language teachers. The follow-up investigation (time 3) took place four months after the completion of the program. Results indicate not only short-term- but also statistically significant long-term effects of the reading program on teachers’ instructional behavior in terms of quality and quantity of taught reading strategies. Moreover, only 14 percent of the teachers fell back into their old instructional patterns (z ≤ .20). Thus, this study 1) demonstrated the program’s short-and long-term effectiveness regarding teachers’ instructional behavior and 2) thereby implicates advice for educational research to widen the focus of investigation towards teacher behavior when evaluating promotional programs for lasting effectiveness.

Effects of two reading comprehension strategic instructional programs on strategies and achievement

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699
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The aim of this study was to analyze the comparative effects of two reading comprehension instructional programs implemented in normal-curriculum classes in 5th and 6th grade of Primary Education by language teachers for improving students’ reading comprehension. The sample comprised 221 fifth and sixth Primary grade students distributed in 11 classes of three schools. Classes were assigned randomized to one of the instructional conditions. The Direct teaching program followed a traditional instruction based on direct teaching and guided practice about four specific reading strategies. The other Strategic and Self-regulated program was based mainly on reciprocal teaching model, that included, teaching of the four reading strategies through teacher’s modeling, students modeling of reading strategies, and collaborative practice in pairs. We took pretest-postest and follow up measures of strategy acquisition, reading achievement, reading self-efficacy and on-line measures of the reading process in summary task. We will present definitive findings in the conference in relation to reading achievement, self-efficacy and the on-line measures of reading and writing processes, but, preliminary analyses concerning the use of reading strategies suggest significant improvement in predicting and summarizing strategies in the Strategic and Self-regulated program but not in the Direct Teaching program.

Supporting primary teacher educators to increase their students’ self-directedness and metacognition

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The development of students’ self-directed learning (SDL) skills and metacognition is increasingly promoted in primary teacher education to overcome problems of transfer of learning to practice. Although the necessity of the development of these skills is generally acknowledged, many primary teacher educators still struggle with ways to adjust the learning environment and their instructional behaviour to achieve this goal. In this design-based research study it is investigated which SDL-opportunities and support teacher educators can implement in their curriculum based on a training in SDL-design principles and by feedback of the design team. The effects of the teacher educators’ efforts on student teachers’ SDL-skills, meta-cognition and motivation are measured. In addition it is investigated what more support is needed to enhance students’ SDL-skills and metacognition. Results are used to gain more insight into ways to support teachers in implementing SDL-support and opportunities in additions results will be used to formulate guidelines for effective application of SDL-design principles in practice.

Developing Concrete Research Proposals and Facilitating Self-Directed Learning via Concept Mapping

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Self-direction in learning and writing viable research proposals are considered by higher education institutions as essential skills for graduate students to start their careers as researchers. This is an evidence-based practice study focuses on the use of concept mapping to facilitate self-directed learning and enhance research proposal writing in teacher education. An action mixed methods research design was used in this study with quantitative and qualitative data. Participants were 29 graduate students who were enrolled in a core course aimed to provide learners with an in-depth understanding of research methods. All students, at the beginning of the course, were asked to write a research proposal and complete the Self-Directed Learning Readiness Scale (SDLRS). They then were given training in the use of concept mapping technique throughout the course to develop research proposals. Students’ scores prior to and after the intervention were compared. Results indicate that students developed significantly more concrete research proposals, and displayed higher (but not statically significant) scores at post-intervention assessment. Findings of this study value and support the use of concept mapping to provide students with a comprehensive understanding of the knowledge of their area of study as they reflect on every element of their proposals.

Fostering academic learning through self-reflection prompts via mobile devices

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While Mobile Learning (in the sense of learning supported by mobile devices) gets more and more popular within the field of higher education, the research by now was rather dominated by a technical point of view. Although there are several efforts to base a more pedagogical point of view, up to the present empirical findings about whether Mobile Learning really is suitable to foster academic learning processes are barely available. The aim of this study is hence to investigate whether and how Mobile Learning could help students to improve their learning by implementing self-reflection prompts via mobile devices. In an experimental field study about 110 university students majoring in media communication will participate. Students of the experimental group will receive an application (app) for their own mobile device (i.e. a smart phone or tablet PC). By means of this application the student will be asked several questions that refer on his or her learning behavior in a specific course in order to stimulate reflection. The answers will be saved and available for the student at any time. Students of the control group will participate in courses without self-reflection prompts via their mobile device. It is expected that students of the experimental group will change their learning behavior due to more reflection during the course and that they will show better learning outcomes than the students of the control group do.

Conceptual limitations in higher education: Achievement and Persistence in perspective

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Mariane Frenay
Academic achievement and academic persistence are two well-known concepts very often studied in the literature. Despite this abundance, the definition and the conceptualization of these concepts keep unclear and not satisfactory. Indeed, there are several limitations that we will present below. The aim of this theoretical poster is to point out these limitations and to propose a better adapted definition of these concepts. We also discuss about the adaptive nature of academic achievement and academic persistence. In the literature, the aim of a lot of researchers is to try to understand how to decrease the rate of failures and dropouts. However, are achievement and persistence always adaptive? We will try to answer this question.

**Chinese and Dutch supervisors’ beliefs about the role of the master thesis for student learning**

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This study aims to explore Chinese and Dutch master thesis supervisors’ beliefs about the role the master thesis plays in stimulating students’ learning about research and how they support students learning during the thesis supervision. In most institutions students conduct authentic research under guidance of their supervisors for their master thesis. Thus, the thesis supervision process provides an opportunity to study the relationship between teaching, research and learning in a context where all three are intertwined. Previous research did not provide a clear understanding of the relationships between research and teaching during students’ learning process and mostly investigated research and teaching as separate tasks of academics. Moreover, few studied the relationships in a context where both teaching and research are present, even less tried to place the relationships in different cultural and economic backgrounds. Interviews with Chinese and Dutch master thesis supervisors revealed that the majority of supervisors expect students to develop critical thinking especially the Dutch supervisors. Chinese supervisors tend to instruct and present themselves as examples or models, supervise in groups, and paid attention to prepare students for future career, in terms of increasing students’ language ability and social skills. Dutch supervisors tend to give tasks and pose questions to students, and focus on students’ research interests or the value of the thesis. The different ways of supervision may have their roots in the different educational traditions, policy environments, and social-economic conditions from the two countries.

**Modeling and measuring competencies in higher education - the new German research program**

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Despite the increasing importance of tertiary education, domain-specific student achievement testing in higher education largely has been neglected in international empirical research. Hence, it hardly is surprising that there is a lack of appropriate instruments for modeling and measuring competencies in most university subjects. To cope with this challenge, the research program 'Modeling and measuring competencies in higher education (KoKoHs)' was initiated by the German Federal Ministry of Education and Research (BMBF) to create a systematic framework for various individual projects in several domains of higher education (e.g., economic, educational and engineering sciences, etc.). The development of domain-specific and generic competence models in selected subjects is intended to create a scientific foundation. The same holds true for the development, testing and validation of instruments to assess comprehensive and subject-specific competencies among students and doctoral candidates. Based on these facts, the poster provides options regarding how several structural and methodological challenges can be met by the multinational and interdisciplinary research program. The poster is intended to provide an overview of the basic steps towards developing a theoretical and methodological basis for a valid and reliable assessment of academic competencies and, thus, awareness of sustainable assessment processes in the higher education sector.

Formalising a Framework of Co-Curricular Recognition for Higher Education Institutions

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For students to have a transformative educational experience they need multiple intentional learning opportunities to develop holistically through formal academic programmes, co-curricular involvement and engagement in campus, local and international community activities (Learning Reconsidered, 2004). Within higher education there is an established process to formally record and recognise learning outcomes in academic programmes. However, a similar process for recording and recognising the learning outcomes of out-of-the-classroom involvement is far less prevalent. International organisations, such as the Council for the Advancement of Standards in Higher Education (CAS), are challenging universities to address this issue by providing foundational work through the creation of standards related to holistic student learning. This led to the researchers exploring how to address the formalisation of co-curricular learning opportunities using their university as a case study. What ensued was a multi-level iterative process shaped by a range of internal and external stakeholders, related research, governmental policies and employment-related initiatives to address skills deficits. From this work, a framework for co-curricular recognition
evolved, which was formalised through the establishment of a Co-Curricular Record (CCR). Key components of the framework include decisions related to the content of the CCR, the role and nature of learning outcomes, and operationalising the CCR as an integrative university-wide system. Integral to the formalisation of the CCR was the development and institutional approval of a CCR policy and the system to implement it. This initiative is an innovative campus-wide solution towards recognising co-curricular learning outcomes while contributing to holistic student development.

**Language and science talent in elementary school**

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The current study describes the language characteristics in natural teacher-child interactions during science and technology lessons in elementary education. The focus is on the extent to which teachers use sophisticated language while at the same time adapting to the linguistic and cognitive level of the child. The purpose of this study is to gain insight into the relation between the specific language of the teacher and the language of the child. The results contribute to the ongoing scientific discourse on natural teacher-child dynamics and the role of linguistic scaffolding. This research is based on data originating from a previous intervention study, based on video feedback coaching (Wetzels, 2012). In the current project, repeated video-recordings (n=8) of five teachers with a small teaching group were analyzed. In the course of the intervention, teachers were expected to gradually produce more sophisticated language, using linguistic scaffolding by means of adapted language. Preliminary results indicate that the teachers clearly adapt their language to the level of the children. For example, teachers in higher grades produce more diverse language than the lower grade teachers. Over time, the linguistic variables which characterize more sophisticated language show a considerable amount of variability in the teacher as well as the children. However, these variables do not increase significantly as a result of the intervention. The present findings provide support for developing an additional coaching module to optimize the teacher language during science and technology lessons.

**Difference between children’s oral and written arguments**

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The argument skills should be educated in early-stage (Reznitskaya et al., 2001). However, there are limited numbers of studies focusing on children. Especially, few studies have clarified difference of utterance and writing. Utterance and writing have different developing process and function (Vygotsky, 1962). To create better conditions for the enhancement of argument skills in education, it is important to clarify the difference between utterance and writings. Moreover, through the positions of supporting children who are in the process of language development, it is essential to investigate the differences and types of adoptive support methods for each discourse. Therefore, this study examined how children’s argument style in utterance (oral discourse) and writing (writing discourse) are different by using quantitative and qualitative analysis. The results suggested
followings: 1) Middle grade children often omitted reasoning and claim in oral discourse. 2) Listeners responses might function as scaffoldings of monitoring. 3) Children could produce reasoning and claim in writing tasks. These findings suggested that degree of sharing context might affect children’s argument activity. Children with highly expecting context sharing might not feel needs of producing reasoning and claim despite this importance. Therefore it is important for intervention to build awareness of what is necessity and lacking. For that purpose enhancing children’s critiquing argument and questioning must be important. Because critiquing and questioning may denote that there are too low sharing of context to understand what they said.

**Effects of vocabulary instructions for kindergarteners who learn English-as-a-foreign-language (EFL)**

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Vocabulary development is being recognized as important in early childhood education. The purpose of this study is to compare 3 pedagogical methods in vocabulary instruction for kindergarteners who learn English-as-a-foreign-language. Instructions that varied in. Forty-three kindergarteners in their final year of pre-primary education from 3 classrooms underwent three different instructions. They were taught 12 targets words, 4 with each method. Targets words were counterbalanced. Quasi-experimental within-subject design was adopted in the current study. Fidelity of implementation was monitored. Researcher-developed assessments on knowledge of the target words were conducted by trained experimenters and Peabody Picture Vocabulary Test was used to assess general vocabulary knowledge. A delayed posttest, 8 weeks after the completion of the instruction was administered. The extent to which the participants can know the meanings was compared among the three groups. Implications are discussed in terms of the strengths and limitations of different teaching methods. Evidence-based instruction approach informs early childhood educator how to design and implement effective vocabulary instruction.

**Japanese students’ understanding and usage of English loanwords**

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Loanwords are commonly considered an excellent resource in the Japanese context for learning English vocabulary. However, recent research suggests loanwords can be ‘false friends’, causing L1 interference. The aim of this study is to compile a comprehensive list of errors Japanese learners make when using loanwords in sentences, and determine discrepancies between learner confidence of word knowledge and accuracy of usage. Statistical analysis of the data, based on item response theory, will steer the linguistic error-analysis offering a deeper understanding of the errors while focusing on high-frequency errors. Using parametric statistical analyses, we will compare the frequency by which the words are considered known by students on checklists against the percentage by which their usage and meaning are accurately given by students in the productive tests. Using multifaceted Rasch measurements we will examine how the words vary in difficulty for students. Under item response theory, we will compare item difficulty and code the word properties by loanword status. The loanword status will follow the ‘List of High-Frequency Baseword Vocabulary for Japanese EFL Students’ (Daulton, 1999). Our pilot research research reveals that loanwords can be beneficial to learning English vocabulary under some circumstances (i.e., word to word
translation), but in order for students to gain a deeper understanding of L2 vocabulary, teachers need to scaffold them into the vocabulary usage. Preliminary analysis shows that students are generally identifying loanwords as known vocabulary, however follow-up productive tests indicate that they are not using the words correctly in sentences.

Assessing listening comprehension at discourse level within the National Educational Panel Study

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Language abilities are important for individuals’ cultural and social life and are a prerequisite for the acquisition of further abilities and knowledge. Research has shown that the development of reading competence is strongly predicted by abilities of listening comprehension. Therefore, the National Educational Panel Study (NEPS) focusses on the assessment of reading competence and listening comprehension at word, sentence and discourse level. The aim of this paper is to describe a framework of listening comprehension at discourse level and to give insight into the test development for ninth grade students. The conceptualized framework is based on the definition of listening comprehension, the differentiation between orality and literacy in texts and the division into fictional and non-fictional types of text. We draw on a four-field-matrix in which different types of authentic audio texts are divided. In contrast to other test of listening comprehension, the construct is measured separately from reading competence, as we use an innovative pure auditory-based answer format.

Developing a test of listening comprehension at discourse-level in grade 9: First empirical results

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Thorough test development is a prerequisite for the implementation of competence tests in large-scale assessments. This paper focusses on the development of a test of listening comprehension at discourse level for grade 9 students. The selection of audio texts is based on a framework, which distinguishes between oral-based vs. literate-based discourse and fictional vs. non-fictional texts, while the complex multiple-choice test items represent different cognitive requirements. The psychometric properties of the newly developed test will be evaluated in a pilot study within the German National Educational Panel Study using IRT modeling. First results of this study will be presented.

Exploring procrastination among school teachers

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This contribution presents preliminary results of an investigation of teachers’ procrastination. Procrastination, the needless delay of (important) things one intends to do, is a widespread self-regulation failure whose negative consequences on subjective well-being have been repeatedly shown. Although procrastination has been studied in different life-domains, the school-domain has yet not been looked at. Having a look at procrastination among teachers seems worthwhile (1) because procrastination seems to prevail in contexts characterized by a great extent of self-determination and scope of actions and (2) because some procrastinators claim role models responsible for the development of their own procrastination. Thus, we are to explore whether teachers could be such role models due to their own procrastination. We compared procrastination between teachers (N = 200) and university students (N = 312) and explored procrastination’s relations with teachers’ individual coping patterns (Type G, Type S, Risk Type A, Risk Type B) and job satisfaction. Concerning the comparison of procrastination values, a one-way ANOVA and post-hoc tests showed that teachers procrastinated less than students. Concerning the coping patterns, teachers assigned to the Risk Type B reported the highest procrastination. However, procrastination was not related to job satisfaction. Although procrastination does not seem to be as pronounced among teachers as it is among university students, this impression could also go back to a selection effect. This and other lessons learned from this study are to be discussed and results of further analyses are to be presented.

Teachers resilience: Exploring perceived challenges and resources in Swiss vocational schools

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There is no doubt that teachers are exposed to challenging and potentially dissatisfying situations. Thus, in the last two decades several studies have investigated teachers resilience in order to analyse how they are nevertheless able to face these situations and additionally to pursue their professional activity developing motivation, commitment and effectiveness. The present explorative study aims at gaining knowledge about the peculiar traits of VET teachers resilience, by deepening which challenging situations they face in vocational schools and which resources and strategies they activate in order to cope with those challenges. Moreover, the study constitutes the first step for designing and activating training resilience building interventions within the VET teachers training in
Switzerland. Forty-five semi-structured interviews on perceived challenging situations are conducted with an heterogeneous sample of Swiss vocational teachers and principals. Quantitative and qualitative procedures of content analysis are applied in order to: (a) identify repertories of challenging situations, as well as of resources and strategies activated for coping them and of motivations to persist in teaching; (b) analyse reciprocal associations between those aspects; (c) identify which aspects could be peculiar of the VET teachers resilience. Among others, preliminary findings illustrate the following challenges for VET teachers: the need to face the low social recognition of vocational schools, the need to manage challenging students, and the feeling to be exposed to a continuous pressure for redefining their teaching approaches in favour of a better integration with the learning at the workplace.

**Peer-Group Mentoring for Teacher Development**

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Supporting beginning teachers in early phase of their career is a European, and even a global challenge. In Finland, after an attempt to apply a traditional one-to-one mentoring model in early 2000’s, the development has been towards organizing mentoring in groups (Heikkinen, Jokinen & Tynjälä, 2008, 2012). The peer-group mentoring model based on the socio-constructivist view of learning and the model of Integrative Pedagogy (Tynjälä, 2008; Heikkinen et al., 2012) is currently being disseminated through a nation-wide consortium of all teacher education departments in Finland. The aim of the present study is to answer the following research question: How do teachers experience peer-group mentoring? Data was collected from group participants (n=140) using online questionnaires and interviews (n=14). The findings of the quantitative and qualitative data show that peer-group mentoring (PGM) strengthens the agency of young teachers and supports their professional identity as autonomous teachers. PGM is experienced as a forum with an open and confidential atmosphere, peer support, partnership, encouragement of colleagues and opening up tacit knowledge. Many new teachers report that through interactive and collaborative learning they are more able to find their own solutions and their individual ways to work. They also report that their commitment to their school community has deepened and they feel better equipped to establish links with the community.

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and its members. Altogether, it seems that the mentoring process helps new teachers to find their place in the school community.

**Blended learning environments in teacher education – Mission impossible for teacher educators?**

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Technological innovations offer variety of new possibilities for learning and teaching, and our understanding on learning and learning environments has increased. However, most schools and universities still remain more or less unaffected by these developments. This is a challenge for teacher education, which should be a pioneer in developing and investigating the use of new technology in teaching and learning. We do know that previous learning experiences are influencing on the beliefs on teaching and learning and therefore, we should offer the learning environments which include new teaching methods with technology and with teacher educators and students who are willing to explore and develop their own practice actively. Our research project ‘Blended Learning, Technology-Enhanced Environments in Teacher Education’ aims to enhance the use of technology-enhanced learning environments in teaching and learning in teacher education. Technology (such as tablets, smart phones and interactive board) is offered for the use of teacher educators and student teachers for that condition that they engage doing research on their practice. Aims are to (1) identify pedagogical solutions for integrating technology to be naturally part of higher education pedagogy, (2) investigate the influence of pedagogical models in teaching and learning and (3) enhance the expertise of teacher educators and student teachers for using technology in education. The results of this study inform us how teacher education institutions might provide that kind of teaching to student teachers so as to encourage inquiry and collaborative working and positively affect student teacher approaches to their learning and responsible teaching.

**Lines of Internationalisation in Business Textbooks - Deconstructing the ‘Globalized Employee’**

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The described project, which is yet in a planning stage, refers to a poststructuralistic inspired analysis of business textbooks used in higher vocational schools in Austria. The main aim of the study is to outline the emerging lines that configure ‘the’ role (possibilities as well as boundaries, threats as well as individual chances) of an ‘employed’ individual in a globalized international business context. What kind of knowledge is offered by the textbooks when it comes to terms of ‘internationalisation’, the ‘European Union’ or a ‘globalized economy’ in general? The overall question leading the analysis is ‘How the text works?’. This implies the question of how the textual material (along with pictures
Collaboration in teacher professional networks can be seen as a fruitful opportunity for teachers to support each other in the collective improvement of teaching practice. Conditions for learning about their teaching are created in these groups, where teachers shared goals and experiences support the emergence of a community. Extensive literature on teacher learning and professional learning communities (e.g., Borko, 2004; Darling-Hammond, 1993; Lieberman & Wood, 2002; Little & McLaughlin, 1993), and on communities of practice theory (e.g., Wenger, 1998; Hoadley, 2012) provide a framework to guide the understanding of the opportunities for learning that teachers can found in professional networks. Conversely, this framework can be challenged by particular set of cases such as those in the context of the Professional Networks of English as foreign language (EFL) teachers that the Chilean English Opens Doors (EOD) program has motivated. Observational and interview data were analyzed to identify alignments and discrepancies between these cases and the theoretical definition of teacher professional learning communities. Findings indicate that in these networks teachers share resources and strategies building community, contrast points of view regarding their teaching practice, and share responsibility for students’ learning. Considering that these networks are intended for the professional development of teachers, there is a valuable opportunity for learning since networks are motivating interactions among teachers from different schools around teaching English in a community-building process.

Dampening of Positive Emotions in Students – Searching for Motives Underlying Emotion Regulation

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The assumption that certain motives can explain why students might prefer to dampen their positive emotions in educational contexts was examined in two studies. We proposed and tested an emotion regulation motives questionnaire for the assessment of these motives in students. In Study 1 (N = 203 high school students; 11th and 12th graders; Mage= 18.17) an item pool for the questionnaire was generated by creating items based on prior research and students’ open responses. Students’ descriptions of the most common situations in which they dampen their
positive emotions revealed that prosocial, self-improvement and protective motives are the most prevalent ones for students in educational settings. A 12-item emotion regulation motives questionnaire was designed in order to assess these three motives underlying students’ down-regulation of positive emotions, particularly after success. It was tested on a total of 178 high school students (10th and 11th graders; Mage = 16.72) in Study 2. The results demonstrate a satisfactory structural validity and internal consistency of the measure. Our studies suggest that the strategy of dampening positive emotions could support students’ goal attainment in educational settings. Experiencing and expressing positive emotions in a classroom setting seem to conflict with students’ certain social- and achievement-related motives.

The influence of stress on memory biases with taking into consideration the trait and state anxiety

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There is still a small amount of research among the relationship between anxiety and memory biases. In existing studies, there is a lack of empirical results and theory. The present study is the first which takes into consideration dispositional (trait anxiety) and situational (state anxiety, conditions in research) factors that could influence memory biases. Explicit memory biases were investigated at a shallow level of encoding (lettering syllables) and free recall paradigm. According to rare meta-analyses, it seems to be crucial for showing memory biases for explicit memory. Affective material was a list of words, including general negative and general positive words and stressor (exam) related negative and positive words. The results indicate that the main factor for the negative memory biases is state, but not trait anxiety. Among extreme anxious group was obtained an interaction at the limit of statistical significance between state anxiety, conditions and presence of manipulation. High, state anxious individuals in presence of manipulation remembered more negative words than those without manipulation. The reported differences were significant only for the high, state anxious in stressful conditions. For those in non-stressful conditions and for the low, state anxious they were irrelevant. The significant effect of interaction between conditions and the presence of manipulations for negative memory bias was obtained among all participants, despite their level of anxiety. The results indicate the importance of situational factors in negative memory biases in non clinical population.

Epistemic Emotions and Learning Strategies

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Achievement emotions influence the types of strategies that students select to engage in a learning activity (Pekrun, Gίtz, Titz, & Perry, 2002). Epistemic emotions, namely surprise, curiosity, confusion, anxiety, enjoyment/delight, frustration, and boredom, have not yet been researched in connection with learning strategies even though they directly relate to the cognitive quality of tasks and the related information processing. Seventy nine undergraduate students participated in our computer-based learning task. Subsequent to the learning phase we assessed the epistemic emotions they experienced during learning (Epistemic Emotions Scales; Pekrun & Meier, 2011) as well as the learning strategies they used during studying (Motivated Strategies for Learning Questionnaire; Pintrich, Smith, Garcia, & McKeachie, 1991). Our data show that enjoyment and curiosity as well as surprise and confusion are associated with the use of systematic learning strategies. Overall our study findings highlight the importance of epistemic emotions in the learning context.

Adult Learning Open University Determinants study: psychological determinants of study success

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As our current knowledge society is changing very rapidly, aging of knowledge and skills is going faster. To keep up with these developments, it is important being able to learn on a higher age. Factors playing a significant role in being a successful learner can have psychological origins. The association between psychological factors and academic performance is well established for children, adolescents, and college students in traditional education. However, evidence of associations between these factors and study success for adult students in distance education is lacking. In the present study, the association between several psychological factors (e.g. affect, test anxiety, goal orientation, learning strategies) and study success for adult students in distance education are investigated. Approximately 2000 students of the Open University will participate in this large longitudinal study, by filling out an online questionnaire and three online neuropsychological tests at baseline. There will be a follow up after six and twelve months. Data collection of baseline takes place September 2012 till September 2013. During EARLI 2013 preliminary results will be shown. The results of this study may provide insight into factors associated with study success in adult students. Based on these results effective learning strategies can be developed in order to optimize the current curriculum.

The classification of types of interest in science according to the degree of a person’s interest

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The purpose of the present study is to develop a scale that can classify the different kinds of interest in science and to examine the scale’s reliability and validity. Previous research maintains that the kinds of interest in learning that exist vary depending on the degree of development of a person’s interest, and that a person with a well-developed interest has stored knowledge about the subject being studied and values it, in addition to feeling positive emotion about it. Items for a new scale were collected in a preliminary study by asking 6th grade and 8th grade students the reason why they think science is interesting. In the main survey, 1,898 students from 5th grade to 10th grade answered the questionnaires. Explorative factor analysis revealed 6 factors: experience-based interest, amazement-based interest, accomplishment-based interest, knowledge acquisition-based interest, thought deepening-based interest, daily life-related interest. The interests scale had incremental validity over an existing interest scale in the prediction of deep-processing learning strategy and learning behavior. The results show that thought deepening-based interest and daily life-related interest are strongly related to deep-processing learning strategy and learning behavior although their means are lower than those of the other kinds of interest.

**Emotional experiences of students in an outdoor educational setting**

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The last decade brought new insights into emotions linked to achievement settings. They are related to students motivation, learning and performance, typically being experienced before, during, and after achievement situations. Emotions refer to the activity itself or the related outcome. Achievement goals are competence-relevant aims for individuals and crucial for achievement motivation. Researchers distinguish them into mastery and performance goals. The first indicates the development of competence, the latter its demonstration. A further bifurcation into approach and avoidance tendencies of these two types of goals has been established. So far quantitative research on these topics in outdoor education has been lacking. Our study prospectively investigates the emotional experiences of school and outdoor educational interventions and the interactions with achievement goal orientations. 34 high school students (10th grade) started in October 2012 on a six-month sailing tour across the Atlantic Ocean. They will answer three different versions of a questionnaire (before, during, after achievement) measuring state emotions (enjoyment, pride, shame, hope, hopelessness, anger, anxiety, and boredom) in different achievement settings: school pedagogical situations like ‘ordinary’ lessons and tests, as well as outdoor educational tasks (like navigating the ship, autonomously organizing of field trips in Cuba or Panama, leading the group, climbing the rigging and mountains). Furthermore, approach and avoidance goal orientations (the
latter as states and traits) will be assessed. In all, 39 measurements per participant will be taken. First results will be presented at the conference.

**An inquiry into the teaching motivations of teacher candidates in Taiwan**

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This study aims to explore the teaching motivations of teacher candidates in Taiwan, as well as their relevant factors. Taiwan’s teacher education system has been recognized to successfully recruit academically able students into the pre-service teacher education program. However, while education administrators in most industrial countries have exerted considerable effort to attract people to and retain them in the teaching profession, the educational authorities in Taiwan have suffered from the overflow of teacher candidates. In order to investigate these issues through a more systematic way, this study employed the Factors Influencing Teaching Choice (FIT-Choice) model developed by Watt & Richardson (2007) as a comprehensive framework to guide the investigation. By using the data from the Taiwan Teacher Education Dataset (TTED) collected in 2009, 2,010 qualified graduates with teaching certificates in secondary education were selected as samples. Preliminary findings of this study indicated that perceived teaching ability and intrinsic motivation are the key component affecting individual’s willingness to choosing teaching, demonstrating more similar pattern of teaching motivations across countries.

**Where do they start? Student teachers’ identity development in three different types of curricula**

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One way to look at the sustainability in teacher education is to analyse the ability of the programme to support the development of solid teacher identities. This paper introduces a 2-year longitudinal research project focusing on examining student teachers emerging teacher identity within different types of curricula in one university setting in Estonia. The data is collected first time in the beginning of the masters programme and second time in the end of the programme, using semi-structured interviews. In this paper I will present the findings of the first data collection and I am inviting the audience to discuss the methodological challenges of studying the development of teachers’ professional identity in a longitudinal study. Elements of professional identity and identity-related experiences from previous study years are discussed from the perspectives of different teacher education curricula. The research adds to the knowledge of how different teacher education programmes contribute to student teachers’ professional identity development, enabling one to make knowledge-based decisions in programme development.

**Recruiting and retaining a diverse student teacher population: Issues for Teacher Education**

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The decisions surrounding who gains admittance to Teacher Education are complex and as a result, multiple forms of evidence are utilised to select candidates into programmes. However there are few studies that have investigated the relative efficacy of admittance criteria in regard to candidate selection, progress and retention. The current longitudinal project aims to investigate the long-term predictive validity of specific admittance criteria to select Teacher Education candidates who will succeed academically and professionally. Utilising quantitative data gathered from 450 first year Bachelor of Education (Teaching) students this paper reports findings from the first phase of the project. Attention is paid to candidates’ entry scores and their subsequent success in the first semester of study. A correlational analysis revealed that there were correlations between a number of the identified entrance criteria and a series of one-way analyses of variance revealed significant differences in terms of gender, ethnicity and programme pathway. Such findings are important given the need to understand the variables that predict undergraduate course completion and retention. They also highlight the challenges that Teacher Education must address if the mandate of creating a more diverse teaching population through the recruitment and retention of a diverse range of students is to be achieved.

Supporting Reflections of Students becoming Teachers about their Professional Identity

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Reflection is an important component of learning processes or rather connected to situated learning (Dewey, 1933, 1986; Schönhuber, 1983; Vygotsky, 1978, 1987/1998). It seems to be essential that teacher educators at universities are asked to help students in learning to reflect different experiences, especially in practice, and accompanying development of professional acting. As a qualitative study concerning to explore the components of professional identity has shown, students becoming teachers are able and willing to reflect themselves, and especially their practical experiences in internships at school and thus to reflect the characteristics of cognitive, affective, and motivational facets of their professional identity (Grzanna, 2012). Based on the model of identity regulation by Haußer (1995) the different facets and components of students’ professional identity were analysed. Students view on themselves at the end of their university studies helped them to draw a differentiated picture about their self-concept, self-esteem, and expectancy of control, and thus about their status concerning their professional development. A central implication of the study was to develop a standardized instrument based on the comprehensive qualitative data. The developed questionnaire can help teacher educators to support students becoming teachers in verifying their decision becoming a teacher, and in developing their professional identity on the one hand. On the other hand it can be useful to select appropriate candidates for further teacher education after studies at universities.

Factors and effects of peer feedback on the acquisition of planning skills in cutting mechanics

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This doctoral project focusses on the investigation of planning strategies in the context of complex problem solving in a vocational education setting. Planning activities of young apprentices in cutting mechanics often lack in thoroughness. To foster the acquisition of planning skills computer-based planning aids including heuristic rules will be developed to support students in their planning activities. Additionally reciprocal peer feedback processes will be initiated based on individual planning results. The factors and effects of reciprocal peer feedback are hardly studied. Thus, several studies are planned to investigate the separate effects of giving peer feedback, receiving peer feedback and reciprocal giving and receiving peer feedback on the acquisition of planning skills in cutting mechanics. The first study is presented here focusing on the impact of giving peer feedback.

**The practice of documentation by teachers**

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The present study is intended as a theoretical reflection on the theme of the practice of documentation by teachers. In particular it considers the context of Italian schools since the practice of documentation is a methodological aspect of the teaching profession established by government regulations (Orientamenti 1991, Indicazioni Nazionali), carried out in different ways and often to which no great value or importance is attached (Benzoni 2001; Specchia 2001; Stradi, Malagoli 2005; Antonietti 2011). Starting from the literature on the subject and some exploratory pieces of research on the theme (Stradi, Malagoli 2005; Antonietti 2011), this contribution intends to highlight some of the problematic key issues of the practice of documentation which require theoretical reflection before they can be researched in the field. There are three themes which this reflection will focus on as well as proposing some in-depth empirical analysis: 1) the recipients and functions of the practice of documentation; 2) creating conditions for useful training in the practice of documentation; 3) the practice of documentation as a useful tool for clarifying the learning process of children (Rinaldi 2001; Moss 2004; Kroeger, Cardy 2006).

**The Role of Coping With Math Related Negative Emotions on Math Achievement of Middle School Students**

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The present study is part of an ongoing project that aims to investigate students’ coping with negative emotions when faced with difficulties in mathematics. Mathematics anxiety being a source of stress for many students is thought to be overcome by some students who can successfully cope
with negative emotions when faced with mathematical difficulties. The theoretical framework put forward by Frydenberg and Lewis’s (1993) adolescent coping model was adopted to investigate this claim. The Coping with Mathematics Scale was developed to evaluate students’ strategies for coping with math anxiety and negative emotions when faced with difficulties in learning mathematics (Ader, 2004). The aim of the present study was to determine the role of coping with negative emotions related with mathematics on the achievement levels of adolescents. Data were collected from 293 middle school students 56% of which were females on measures of math anxiety and coping with negative emotions related with math. The students’ grades showing their previous math achievement and their scores on a math test were obtained. Results indicated that of the three coping strategies with negative emotions related with math, coping focused on solving the problem was the most widely used strategy. The preliminary analyses showed that coping with negative emotions related with math would be a relevant variable in helping math anxious students and designing effective learning environments.

Experiencing a peer support program with young offenders in confinement centers

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School context has provided the idea of minors dealing with their conflicts, as part of the solution for the improvement of the climate and the prevention of bullying. More than a decade ago, experiences in Europe with peer support programmes show them as powerful instruments for developing and improving social skills, involving feelings and actions. Results of evaluations show that it is the young involved who receive the main benefits from their participation. The aim of the present research was applying the programme to centers where minor offenders are confined by the juvenile justice system for reeducation. The design of the research included a pilot study in order to meet the organizational requirements of the penal system’s markedly restrictive context. Participants in the training sessions where twenty-two minors of two centers of different characteristics (gender representation, criminal behaviours, etc.) and three educators in both. First data about the evaluation of the training were collected through interviews -with the educators - and focus groups - with peer helpers. Educators perceived positive changes in some minor helpers, improving self-confidence and social skills. Young participants assessed very positively the training, having improved their social skills and feel useful. Nevertheless, the first follow-up sessions showed resistances from the supporters to take responsibility, a strong external locus of control as key mechanism of causal attribution. Theses foundings recommend to emphasize in the training objectives related with cognition and personality, also working the locus of control and the possible selves.

Predictors of PhD completion: A qualitative study with successful and departing students

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Belgium

Gentiane Boudrenghien
A significant number of the PhD candidates who enrol in the doctoral process leave it before the end (Gardner, 2010). Why is it the case? What are the central factors leading to PhD drop out and how do they interact with each others? If dropout during earlier stages of higher education has received significant attention, less systematic research has been conducted on persistence in the doctoral context. The present study is part of a longitudinal mixed-method and multi-institutional research project funded during four years in Belgium. In the present study, semi-structured interviews were conducted with 12 PhD students from two universities and various academic areas; 6 who successfully completed their PhD and 6 who quitted before completion. The aim was to unfold the factors at play in PhD persistence, assess their relative importance, and analyse their interrelations. More precisely, we investigated the interactions between contextual and individual factors, suggesting that the influence of the context (e.g., supervisor support) depends upon the characteristics of the individuals (e.g., expectations, specific needs, stage of the doctoral process). Analyses were conducted with NVivo 9 using the constant comparative method (Bogdan & Biklen, 2003).

How the working environment of higher education affects teacher identity

Thea van Lankveld
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Netherlands

Judith Schoonenboom
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Netherlands

Jos Beishuizen
VU University Amsterdam
Netherlands

Gerda Croiset
VU Medical Center
Netherlands

Monique Volman
Some teachers in higher education (HE) see themselves as teachers; whereas others see themselves as researchers who teach. The working environment of HE plays an important role in this, since identity is not developed in a vacuum but is situated in the collectively formed social practices of HE. In this study we investigate in what way the working environment of HE influences the development of a professional identity as a teacher. Based on semi-structured interviews with 22 staff members with a teaching role of a Dutch Medical School, we found that these staff members have limited identification with the teaching role. Findings show that in the social and collectively formed practices of this Medical school, research and patient care are constructed as the main identities; an identity as a teacher is hardly afforded. At some departments of the Medical school, teaching is not acknowledged as an explicit task, but is seen as implicit part of research or patient care. Role models and formal or informal conversations about teaching are scarce. As a consequence, there are few possibilities to negotiate an identity as someone who likes teaching. In this round table we will share some data from this study and analyse them together.

The perception of primary school teachers on integrating language and science education

Martine Gijsel
Saxion
Netherlands

In the present study, sixty-nine teachers from several primary schools in the Netherlands (Grades 4, 5 and 6) participated. All teachers received a questionnaire concerning general school information, routines and procedures in science education, teacher’s perceptions of and experience in science education, and teacher’s attitudes towards language education and integrating language and science education. The first research question was: what are the characteristics of science education in the middle and higher grades in the Netherlands? Results showed that teachers spend an insignificant amount of time on science education: 43% spend 0 to 30 minutes monthly and 25% spend 30, 60 minutes a month. Almost 75% had never received additional instruction or coaching on science education. With respect to the role of language education in science lessons, it seemed that most teachers paid attention to vocabulary instruction and reading comprehension. Other language components like oral presentation, discussing and writing were only incidentally reported. The second research question was: What is the attitude of teachers towards integrating language and science education? Most of the teachers reported a positive attitude on combining language and science education. They mentioned the added value of vocabulary instruction and instruction of reading and listening strategies, the urge of supporting children with language difficulties and the reciprocity between language and thinking. The implications of this study for educational practices and future research will be discussed.

Sensible Academic Development: Striving Towards Making Academic Development A Community Property

Teija Loytonen
Aalto University
Finland

Research on disciplinary cultures has emphasized how fundamentally teaching and learning are intertwined with the epistemic cultures and social practices of a particular discipline. This means that the teaching and studying practices vary from one discipline to another: the nature and processes of teaching and learning, student supervision and assessment as well as collaboration between teachers are approached differently and from different premises. However, the academic development
support and courses offered in university pedagogy in Finland are mostly provided centrally and accordingly generic courses predominate. The ongoing five-year research project, that this proposal is based on, explores alternative opportunities in university pedagogy and academic development. It takes a closer look at disciplinary differences from the perspective of Finnish art universities. The discipline-based academic development is approached through a process of collaborative inquiry amongst teachers from art universities. A vital principle in our process is to honor the full range of human sensibilities as an instrument of knowledge creation on higher arts education, thus, striving to bridge the gap between academic (and pedagogical) development and the (different) disciplinary fields. Based on the research process, it will be further argued, that acknowledging the full range of human sensibilities as an instrument in knowledge creation and learning will enhance sensitivity and responsiveness to diversity, disciplinary richness and complexity within academia and academic development.

Robert Glaser and Expertise

Michelene Chi
Arizona State University
United States

I will discuss Bob Glaser’s substantial contribution in the work on expertise, and what we were able to accomplish together on that topic. We published several papers and chapters, and an influential edited book on The Nature of Expertise. Bob loved conferences and workshops, so we also organized a conference at the Learning Research and Development Center, on expertise. I will briefly summarize this work, as well as the direction of the current research in the literature on expertise, and how it relates to his contributions.

Robert Glaser – Promoter of Knowledge Construction Processes in Learning and Instruction

Heinz Mandl
Ludwig-Maximilians-University Munich
Germany

At the end of the 70s and during the 80s I met Bob Glaser many times at the AERA conference and at the Learning Research and Development Centre (LRDC) in Pittsburgh. There he offered me extensive insights into the cornucopia of his distinguished research and development center. I was confronted with his innovative research on knowing, learning and instruction. Bob Glaser had developed a framework on a learning theory for instruction, which includes two primary features. One is the centrality of the structure of knowledge, the other the generative strategies that learners bring to constructing knowledge. Especially these research activities on knowledge construction and knowledge dependent learning stimulated my research group. They were particularly valuable in the context of our DFG Priority Programs on the topics of facilitating knowledge acquisition in domain specific areas and net-based knowledge communication learning contexts. The outstanding research work of Bob Glaser’s and Lauren Resnick’s LRDC were a primary inspiration for Erik De Corte, a number of other colleagues and me to establish EARLI as a means to promote research on learning and instruction in Europe.

Robert Glaser and the Design of Technology Based Learning Environments

Stella Vosniadou
National and Kapodistrian University of Athens
Greece
Robert Glaser was one of the most influential Educational Psychologists of our century who helped define the field of learning and instruction. I was fortunate to work with Dr. Glaser in organizing an international workshop and two edited volumes on the Design of Technology Based Learning Environments. In my presentation I will focus on his work on this area. Dr. Glaser was one of the first learning researchers to realize that there can be a fruitful two-way interaction between basic and applied research in learning and that the study of learning environments can provide important insights that can enrich our understanding of learning processes.

**Robert Glaser and Instructional Psychology**

James Pellegrino  
University of Illinois at Chicago  
United States

Robert Glaser was committed to the cumulative nature of knowledge building in the cognitive sciences and the continual exploration of ways to bring scientific knowledge to bear on problems of educational practice. He helped organize the first international conference on Cognitive Psychology and Instruction that was held in 1977 in Amsterdam. He saw education as a ‘design challenge’ and he helped frame the idea of a field known as Instructional Psychology. He construed it as a design science, bridging the worlds of psychological theory and classroom practice. Paramount in his own theory of learning was the importance of differences among individuals and the need to assess and account for these in theories of learning and in the design of educational practice. Throughout his career, he worked tirelessly to establish these as mainstream assumptions of work in cognitive, psychometric, and educational psychology. In this presentation I will focus on some of Robert Glaser’s major contributions to understanding and improving the design and use of educational assessments, including our collaboration on the National Research Council report Knowing What Students Know: The Science and Design of Educational Assessment.

**Robert Glaser: Giant of Research, Bridge-builder between Europe and the US, and Personal Friend**

Erik De Corte  
University of Leuven  
Belgium

Robert Glaser’ impact during the second part of the 20th century on the shaping and the development of the science of learning, instruction, and assessment has been tremendous. But in this presentation I will first document his influence on my own research that started already a decade before I met him for the first time in 1977. But at this EARLI Conference his important role in building bridges between Europe and the USA in instructional psychology has to be put in the spotlights. This started with his involvement as an organizer of the 1977 NATO International Conference on Cognitive Psychology and Instruction, and continued with his active participation in the first and subsequent conferences of EARLI, and in NATO Advanced Study Institutes in Leuven and Crete. I will end my presentation with some remembrances of Bob as a warm and generous personal friend from 1980 on when he was confered the Honorary Doctorate at the University of Leuven.

**Promoting science through inquiry: What are conditions for effective inquiry learning?**

Ard Lazonder  
University of Twente  
Netherlands

Astrid Wichmann  
Ruhr University Bochum
Recent studies in the field of computer-supported inquiry learning call for learning environments that allow learners to design experiments, make observations, and draw inferences from data by constructing, communicating and debating explanations. Engaging learners in these processes is generally considered to be a challenging task. One challenge is related to the way learners interact with learning environments. Interactive events may enable deep processing of information, but too much interaction may lead to confusion and frustration. A second challenge is finding the right balance between offering supportive information and having learners find out things for themselves. A third challenge concerns ways to engage learners in social activities that promote learning. Collaboration may have beneficial effects for learning, however only if collaboration activities are carefully designed. We present studies that investigate conditions for effective inquiry in multiple ways: (1) by offering designated forms of explicit and implicit support, (2) by leveraging learning across social planes and (3) by promoting interaction.

### Inventing compared to worked-out problems: Which processes foster transfer in Physics?

Inventing and productive failure approaches use short inquiry phases to prepare learners for subsequent direct instruction. Students invent solutions to open problems prior to being instructed the canonical solutions. These approaches have been shown to prepare learners effectively for learning. Reasons for these effects could be that inventing a solution to the open problem can make the learners aware of their knowledge gaps (cognitive) and more curious about and interested in the learning contents (motivational effects). These effects can enhance transfer in the end. From a different point of view, working on the same problem, but with a given (optimal) solution can be expected to induce less extraneous load and may help avoid misconceptions. It provides useful basic knowledge which might enhance self-efficacy. In an experiment (N = 40), we tested to what extent working on an open (inquiry) problem (inventing) versus on a worked-out version of it prepares 8th-grade students for learning about ratios in physics. Working on a worked-out version led to less extraneous load, less perceived knowledge gaps, higher self-efficacy, and, in the end, to higher far transfer scores. Perceived knowledge gaps and self-efficacy mediated the effect on far transfer. Hence, we could not show the efficacy of the inventing approach in comparison with a control condition that resembles a strong direct instruction condition (i.e., worked-out example).
Suggestions about further studies (with strong comparisons) are discussed to find the active ingredients of inventing or productive failure approaches.

**Effectiveness of explicit and implicit instructional guidance to learn and use the CVS**

Ard Lazender  
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Netherlands  

Angelique Egberink  
University of Twente  
Netherlands  

Direct instruction is a proven effective method to strengthen children’s ability to design unconfounded experiments using the Control-of-Variables Strategy (CVS). Recent research suggests that task segmentation can also promote children’s use of this strategy. The present study investigated this assumption by comparing the relative effectiveness of both instructional approaches in elementary science classes. Children in the direct instruction condition (n = 22) were taught the CVS prior to investigating a multivariable inquiry task. Children in the task structuring condition (n = 23) were not, but received a segmented version of the inquiry task that addressed the variables in successive order. Children in the control condition (n = 22) investigated the multivariable inquiry task without additional support. Comparison among these three conditions revealed that task structuring equals direct instruction in effectiveness to promote children to use the CVS and draw valid inferences, and that either type of guidance is more effective than unguided inquiry learning. However, as children’s knowledge of the CVS improved as much in either condition, more practice seems needed for children to take full advantage of both instructional approaches.

**Fostering students’ collaborative online search processes with small group and classroom scripts**

Ingo Kollar  
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Germany  

Christof Wecker  
University of Munich  
Germany  

Sybille Langer  
Ludwig-Maximilians-Universitat Munchen  
Germany  

Frank Fischer  
Universitat Munchen  
Germany  

The Internet has become a major source of information to develop positions in science-related debates (e.g. on pre-implantation diagnostics). However, high school students often have problems in effectively using the Internet for this purpose, which calls for instructional support. In a previous study in 9th grade Biology classrooms (N=144), we showed that both small group collaboration scripts (i.e. interventions that structure dyads’ Internet search processes) and classroom scripts that combine plenary modelling phases and group level phases of online search are effective ways to help students acquire online search competence as measured by an individual declarative posttest. However, combining the two instructional interventions did not further enhance students’ posttest
performance. The present contribution looks at process data, i.e. collaborative online search strategy use, from this study to identify the mechanisms behind this result. Results of the process analyses show that both interventions helped students to exhibit more extensive collaborative online search strategy use, and the effects of the small group script and the plenary plus group level classroom script appeared to be additive. While in three of the four conditions the correlation between collaborative online search strategy use in the learning phase and posttest online search competence was positive, these two variables were negatively correlated when both scaffolds were combined. A tentative explanation for the latter result is that students may exhibit a high degree of collaborative online search strategy use without actually internalizing the strategy due to over-reliance on the rich scaffolds with the combination of the two scaffolds.

Understanding elementary astronomy using drawing-based models

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Hannie Gijlers
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Lars Bollen
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Modelling is an important approach in the teaching and learning of Science. In this study we attempt to bring modelling within the reach of young children by creating the SimSketch modelling system, which is based on freehand drawings that can be turned into simulations. 248 children in the age range from 7 to 18 used this system to create a drawing-based model of the solar system. Participants showed significant improvement in domain knowledge from pre-test to post-test, particularly for children younger than 12 and for girls. The quality of the model created contributed independently to knowledge acquisition: when corrected for prior knowledge score, there was an independent contribution from drawing quality on post-test score. The study shows the potential of the drawing-based modelling approach. In this study, learners were able to create drawn models and to learn from them. It has the potential to let learners express their misconceptions in a natural way and learn from the confrontation of the model output (in our case an animation) with their own observations.

Trends in Support for and Analysis of Collaborative Learning- Part II: Analysis

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Nikol Rummel
Institute of Educational Research, Ruhr-Universitat Bochum
Germany

Tamara Van Gog
Collaborative learning is omnipresent in education, whether in face-to-face or in computer-supported learning settings. The topic has recently achieved a lot of research attention for two reasons: the expected potential of collaboration to promote learning, and the increasing importance of social competences and team work in many work contexts. Moreover, technological advances have opened new possibilities for, and afford new forms of collaborative learning. Research on collaborative learning has centered around two broad questions: 1) How to optimally design support for collaborative learning? This question is of central importance, as it is long known that collaboration will only unfold its potential for enhancing learning if certain types of socio-cognitive processes occur in the interaction. 2) How to analyze collaborative learning data? Analyzing data from collaborative settings creates many challenges because the learning processes, and thus the data, of the collaborating partners are closely intertwined. This adds to the common challenge of taking into account both process and outcome data in analyzing learning. This invited double-symposium of EARLI SIG 6 (Instructional Design) and SIG 7 (Learning and Instruction with Computers) comprises a set of four presentations on each of the two thematic strands, featuring comprehensive summaries and new trends and innovations of recent research. Both sets of presentations will be completed by discussions of leading researchers in the two fields.

Connecting Levels of Analysis in Collaborative Learning: Artifacts and Actions

Sten Ludvigsen
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Norway

Various approaches to social interaction acknowledge the importance of the cognitive aspects in the collaborative process, but also of the social and institutional aspects. The two latter can, in some cases, determine the success or failure of the cognitive aspects. These different aspects of collaboration are rarely studied as connected. To understand collaborative learning in short- and long-term cycles of activities and how they are embedded in specific practices and social institutions, we need a theoretical perspective that can account for phenomena at different layers of description and timescales. The three layers are socio-, micro-, and ontogenesis. Sociogenesis is understood to be how social and cultural resources are organized and become sustainable over time. Artefacts in Computer Supported Collaborative Learning (CSCL) settings represent an accumulated body of knowledge, which means that are part of the sociogenesis. Micro-genesis refers to how participants interact in social encounters and the kind of resources upon which they choose to draw in order to perform. Ontogenesis is the individual development of the participants and what they bring to activities in the workplace. The argument is that it is at the intersection of these three layers that collaborative learning with and without technology can be understood.

Understanding Quality Variation in Socially Shared Regulation: A Focus on Methodology

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United States

Lisa Linnenbrink-Garcia
Duke University
Previous research on the social processes groups use to regulate their joint work on a task, or socially shared regulation, has used illustrative examples to validate the constructor has highlighted the concurrent use of different types of regulation. With exemplars of high and low quality socially shared regulation as our grounding, we build from this research to explore the full range and variation in the quality of socially shared regulation exhibited by six 4-person collaborative groups. A second goal of our research has been to provide explanations for observed variation in quality, with a focus on the role of group process (e.g., socioemotional interactions). In this presentation, we draw from recently reported research and a recent chapter focused on methodological advances to illustrate how interactive, multi-level analyses can be used to analyze the complex phenomenon of socially shared regulation within collaborative groups (Rogat & Linnenbrink-Garcia, 2011, 2013). Specifically, we use the special case of socioemotional interactions within the group to illustrate how group processes help to explain between-group variation in quality and to highlight our analytic approach.

**Dual Eye-Tracking: Lessons Learnt**

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CRAFT-EPFL  
Switzerland

Patrick Jermann  
Ecole Polytechnique Federale de Lausanne  
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Marc-Antoine Nuesli  
Ecole Polytechnique Federale de Lausanne  
Switzerland

Pierre Dillenbourg  
Ecole Polytechnique Federale de Lausanne (EPFL)  
Switzerland

Dual eye-tracking (DUET) is at the confluents of cognitive (and social) psychology and computer science. DUET is a novel methodology to explore the socio-cognitive processes underlying collaboration. The basic aims of DUET are to better understand, through gaze indicators, a socially distributed cognitive system and to support collaboration by real time gaze display of collaborators. We are interested in finding whether and how patterns of eye-movements can reflect the cognition underlying collaboration. This paper concentrates on the major motivations, methodological challenges and the future aspects of DUET.

**Automated Approaches to Analyzing Data from Collaborative Learning Settings**

Carolyn Rose  
Carnegie Mellon University  
United States

Elijah Mayfield  
Carnegie Mellon University  
United States

Gahgene Gweon
Korea Advanced Institute of Science and Technology
Korea, Republic of

In this talk I will present recent work on computational modeling of social positioning in conversational interactions, or leadership taking in collaborative learning interactions more specifically. The theoretical contribution of our work in this area is the reinterpretation of largely qualitative frameworks from sociolinguistics and discourse analysis from a computational perspective, with a particular focus on frameworks characterizing interpersonal dynamics within the theory of Systemic Functional Linguistics (SFL). The key idea behind the computational work is to take these rich theoretical models from sociolinguistics and discourse analysis, and pair them down to precise operationalizations that capture the most important essence of what is happening for achieving impact. Our approach is always to start with investigating how conversation works and formalizing this understanding in models that are precise enough to be reproducible and that demonstrate explanatory power in connection with outcomes that have real world value, such as learning and self-efficacy. The next step is to adapt, extend, and apply machine learning and text mining technologies in ways that leverage that deep understanding in order to build computational models that are capable of automatically applying these constructs to naturally occurring language interactions. Finally, with the technology to automatically monitor naturalistic language communication in place, the final stage is to build interventions that lead to real world benefits.

EARLI meets Learning Sciences: Can we take advantage of the methodological advances from each other?

Frank Fischer
Universitat Munchen
Germany

Frank Fischer
Universitat Munchen
Germany

Sanna Jarvela
University of Oulu
Finland

Susan Goldman
University of Illinois at Chicago
United States

There have been considerable methodological advances in research on learning in different research communities. Interestingly, the two sister communities organized in EARLI and ISLS, recently have seen methodological developments in their studies on learning that have trajectories leading in seemingly diverging directions like e.g. the adoption of neuroscience methods and design-based research. Appreciating these different developments, this symposium seeks to provide analyses of methodological advances in fields central to the two research communities as design-based research and the analysis of relations between cognition and discourse in the learning sciences community, as well as neuroscience methods and multilevel analyses in research on learning and instruction. Areas of potential synergies between the methodological developments in the two sister communities will be identified. In the symposium, two early career researchers from learning and instruction research and from the learning sciences will present their individual analyses of methodological ‘standards’ and methodological trends and innovations in their fields, including illustrative examples of recent studies. Then, in the role of discussant, Susan Goldman who has been active and influential in both
communities will identify areas of potential synergies and offer her own perspective on how the fields might (or should) co-evolve in the coming years.

**Advances in Design-Based Research in the Learning Sciences**

Vanessa Svihla  
University of New Mexico  
United States

Design-Based Research (DBR) is a core methodology of the Learning Sciences. Begun as a movement away from experimental psychology, it is a means to develop ‘humble’ theory that takes into account numerous contextual effects for understanding how and why a design supported learning. DBR involves iterative refinement of both designs and theory. DBR is sometimes conflated with mixed methods; this, paired with calls for educational research to parallel medical research has led Learning Scientists to strive for more specific standards about what constitutes DBR and what makes it desirable, especially regarding robustness and rigor. A recent trend in DBR involves efforts to extend the reach through scalability. These developments potentially endanger the designerly nature of DBR by orienting focus toward generalizability, meaning researchers must be vigilant in their pursuit of understanding how and why learning occurs in complex contexts. Two cases will be presented to showcase designerly and scalability aspects.

**Advances in the analysis of temporal characteristics in learning and instruction**

Inge Molenaar  
Radboud University Nijmegen  
Netherlands

Frank Fischer  
Universitat Munchen  
Germany

This paper focuses on a new trend in learning and instruction to analyse temporal characteristics of learning. Constructs formerly viewed as personal traits, such as self-regulated learning and motivation, are now described as events that unfold over time. This raises new questions with regard to the temporal characteristics of these constructs and their dynamic interplay with the learner and the learning context. Several event-based methods, such as statistical discourse analysis, markov modelling, t-shapes and trace data analysis are used to explore temporal characteristics. To illustrate this in this talk an example will show how statistical discourse analysis is used to explore students’ regulation during collaborative learning. The findings indicate that there are reoccurring sequences among students’ cognitive, metacognitive and relational actions that support social regulation. Even though this examples indicate the value of analyzing temporal characteristics, a number of issues need to tackled in order to progress our field toward understanding the influence of time on learning. First, a conceptual framework to create a common understanding of different concepts of time needs to be explored. Second, we need transparency in our approaches to segment time. Third, a better understanding of methods is desirable. Fourth, we need to deal with different levels of granularity and effectively integrate results from different approaches for meaning making. Finally, so far we have done mainly explorative studies and there is a need to move toward confirmative studies, i.e. prove that the temporal characteristics discovered actually contribute significantly to learning outcomes.

**Advances in the analysis of discourse in Computer-Supported Collaborative Learning**

Karsten Stegmann
The quality of collaborative learning processes is usually defined theoretically. CSCL researchers typically assume positive relations between specific features of the collaborative process and successful collaborative knowledge construction. To these relations, apply discourse analysis methods that segment the process data and assign each segment a category per dimension regarded important. Developments in the field of natural language processing enable technologies to emerge, which support and streamline multi-dimensional discourse analysis of collaborative learning processes. Machine learning algorithms are used to extract specific features of segments (like length, specific words, n-grams, bi-grams) to predict the probability of specific codes. Such analyses are the base of a further high-level analysis that make use of the quantified qualities of CSCL.

**Advances in the use of neuroscience methods in research on learning and instruction**

Bert De Smedt  
University of Leuven  
Belgium

Cognitive neuroscience offers a series of tools and methodologies that allow researchers in the field of learning and instruction to complement and extend the knowledge they have accumulated through decades of behavioral research. The appropriateness of these methods depends on the research question at hand. Cognitive neuroscience methods allow researchers to investigate specific cognitive processes in a very detailed way, a goal in some but not all fields of the learning sciences. This value added will be illustrated in three ways, with examples in field of mathematics learning. First, neuroimaging data allow one to examine at the biological level how people learn. Such data can provide converging evidence for findings that have been obtained through behavioral research and this convergence of findings from different research methodologies provides a more solid ground for our theories on how learning takes place, an issue that I will illustrate with our research on arithmetic strategy use. Second, neuroimaging data can provide a level of analysis and measurement that cannot be accessed by behavioral studies alone, adding new insights to theories of individual differences in arithmetic (fact) development. Finally, and more indirectly, neuroimaging data can be used as an input for educational research, by drawing our attention to the importance of numerical representations as a potential origin of individual differences in mathematical achievement and of atypical mathematical development.

**The Ethos of the Teacher**

Martin Gartmeier  
Technische Universitat Munchen  
Germany

Manfred Prenzel  
Technische Universitaet Muenchen  
Germany

Tina Hascher  
University of Salzburg / University of Bern  
Austria

The importance of the ethos of the teacher is highlighted prominently in this year’s EARLI conference theme: ‘Responsible teaching and sustainable learning’. The teaching profession, like any other professional group, bears a responsibility arising partly through societal values and expectations,
partly through the socio-historically evolved standards of the practice. According to the conference theme, today, we conceive teachers as being responsible to enable students’ attainment of ‘multiple and challenging educational goals’, ‘to provide powerful, motivating and social learning environments’, and to enable learners ‘to develop their character, being open minded and develop own ideas’. The way how teachers negotiate their professional identity with such expectations, how they endorse them for their own professional value system, and how they enact them in practice constitutes their professional ethos. This symposium aims at pushing forward the understanding of teachers’ professional ethos. It does so by bringing together different theoretical and empirical perspectives from research on professionalism, teachers, and teaching. As organizers, we hope that the symposium will help to consolidate theoretical conceptions of ethos and constitute a stepping stone for further research.

**Comparative studies of ethos using the lens of ‘signature pedagogies’ as an analytical framework**

Lee Shulman  
Stanford Graduate School of Education  
United States

The concept of the teacher’s ‘professional ethos’ calls attention to the centrality of character, manner, identity and values in the development of teachers and the roles they play in schools and classrooms. This emphasis creates a balancing effect in comparison with the tendency to view teachers as primarily skilled performers and thinkers, ‘reflective practitioners’ who either act thoughtfully or think actively. In the twelve years of research my colleagues and I conducted on how members of various professions are taught in formal programs of preparation, we identified a ‘core’ of professional development (often using the term ‘formation’) wherein the identities, values and personal qualities of professions were shaped. Generally, the primary approaches to educating those professionals, the ‘signature pedagogies’ of the professions, were connected to those aspects of formation. I shall draw from key findings of the Carnegie studies of learning in the professions and examine the development of teachers through those lenses. These findings will be compared to those reported in other contributions to this symposium about the development and impact of teachers’ ethos. The role of professional training in the formation of professional ethos will be examined.

**Against all odds: A concept and its empirical validation of an action-oriented ethos for teachers**

Fritz Oser  
Universität Freiburg  
Switzerland

Sarah Heinzer  
Universität Zurich  
Switzerland

Horst Biedermann  
University of Flensburg  
Germany

The pressing need for measuring ethos as an important aspect of teaching professionalism has until now widely been neglected. We understand ethos to be an ethos of acting as decision-making in critical situations. Our analysis of different theoretical ethos models does rely precisely on these situational and contextual conditions. In concrete, on the basis of Oser’s (1998) concept of procedural professional morality in a new study we operationalized the ethos construct as a combination between decision making and underlying motivational reasons as well as the effort to
create a sound environment conducive for learning. By means of four different scenarios, which
described a pedagogical situation whose purpose is challenged by external factors such as time and
cost pressure, the ethos value of 606 vocational trainers was calculated. The results indicate a strong
impact of the situational characteristic on the trainers’ ethos value. At the same time, a positive
correlation between the trainers’ awareness of their training responsibility and the ethos value has
been found. In another study, which concentrated on the design of the learning environment, we
found a positive impact on the students’ development if teachers give them a share in professional
problem-solving processes. The results confirm the assumption that ethos not only is significant
regarding the teachers’ or trainers’ professionalism but also importantly affects the students’ or
apprentices’ development.

On Ethos and Micro-Processes of Teaching and Learning: Findings from a Video-Study in Physics

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Germany

Richard Shavelson
Stanford University & Sk Partners
United States

Oser (1994) describes pedagogical pre-supposition as a concept related to teacher ethos that is
relevant for classroom interactions. Pedagogical pre-supposition involves how teachers convey
through their language, gesture and other behavior a belief that a student is able to participate, to
find solutions, to take responsibility, to learn. The adequate way of providing pre-supposition is
mirrored in concepts such as the zone of proximal development (Vygotsky, 1978). In our study we
applied this perspective and investigated micro-level teacher-student interactions in classrooms
(Shavelson & Seidel, 2006). We were particularly interested in how teachers interact with a specific
student group (Jurik et al., 2013), students who underestimate their competencies (high cognitive
pre-requisites but low self-concept = ‘underestimating students’). We asked: Do teachers
provide support for these students? To what extent do teachers encourage these students to interact
with them? We analyzed data from 1378 physics students; 29% showed an underestimating profile.
We then analyzed eighty-one video recordings of physics instruction finding that in regular
classrooms underestimating students perceived instruction as less supportive than strong students.
The students hardly engaged in interactions with teachers and teachers did not specifically
courage these students through individual feedback or support. The study indicates that teachers
might need more information about their students in order act with ethos.

Approaches to investigate teachers’ ethos in large scale studies: Exemplary findings on teachers’ ed

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Germany

Manfred Prenzel
Technische Universität München
Germany

After a period in which teacher research focused heavily on measuring teachers’ knowledge, there is
a renewed interest in the more ‘soft’, subjective dimensions of teacher professionalism. Behind this
interest lies the idea that professionalism is constituted by more than just the ability to perform.
Becoming a professional involves, next to acquiring performance-related dispositions, a socialization
process in which individuals form a professional identity by negotiating their own beliefs, attitudes,
goals, and values with the shared code of conduct of a community of practice. This perspective is elegantly summarized in the concept of a ‘professional ethos’. Because of its importance, large several scale-studies have aimed at investigating teachers’ professional ethos, albeit measuring it differently. In our presentation, we exemplify one of these approaches to the assessment of teacher’s professional ethos by looking at the educational goals they endorse in school and family. These goals shed light, first, on the individual systems of values that teachers conceive as underlying their profession. Second, they are indicative of the scope of responsibility that teachers endorse for educating their students. Drawing on data from a German panel study on pre-service teachers (PaLea), we investigate these educational goals and their development during teacher education.

Invited Symposium by EAPRIL - Reflecting on methodological principles for practice-oriented research

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Educational research suffers from the limited transfer of insights to educational practice. However, educational research by practitioners is characterised by a direct link to practice, i.e. research for and through practice. The implementation is often organised within universities, research groups and practice-oriented research institutions but also increasingly by teachers ‘on the field’, i.e. as practitioner-researchers. This line of research is seen as research that actually contributes directly to practice, as compared to (fundamental) research organised in universities. However, the question is raised whether practice-oriented studies have to meet the traditional scientific standards? Are these standards adequate for practitioner-based educational research? Are they complementary or are other principles serving in educational practice? Moreover, what is the nature and methodology of practice-oriented research? Should it formulate its own principles? If so, which methodological principles would this line of research involve? This invited symposium aims for an in-depth conversation on the nature, methodology and principles as formulated by action research, design-oriented or ecologically & transdisciplinary inspired (ETI) research. The organisation is in the hands of EAPRIL, the European Association for Practitioner Research on Improving Learning. 4 presenters are invited to present their ideas on the challenges formulated above. These presentations will be followed by a discussion about whether or not the general standards for practice-oriented research are sufficient and/or adequate, or that supplementary standards are required. During this session the audience will not only join the discussion but will be also invited to express their online votes about these statements.

Paradigm coherence and consequential required competences as prerequisites for research for practice

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In various countries practitioners in education, politicians and even (some) researchers complain about the fact that research cannot be used in actual practice and/or that practitioners are not using (and benefitting from) educational research. This has caused debates on for instance external versus internal validity, or on the use of evidence based research in the education sector. In the attempt to connect research to practice there is a trend in some countries of practitioners carrying out educational research. I argue that, if practice oriented research is meant to improve the situation in practice, it has to be of good quality. And that this means that research relevant for practice requires coherence in the different decision making phases. Therefore, adequate decision making in all phases of the research project is needed. This requires awareness and specific competences of the researcher: the competences to carry out the research (from developing the question to analyses of the data and reporting), as well as the knowledge about the possibilities and limitations of the paradigms and the research methods. Only then research can really contribute to practice. In this contribution I will elaborate on the decisions that need to be made and their consequential requirements of researchers, by discussing concrete examples of good and not so good use of research paradigms and methods such as design based research, action research that has been carried out in practice and by practitioners and (other) researchers, and provide some ‘lessons learned’ for practice oriented research.

Paradigms and Principles Shaping Educational Design Research

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Educational design research is a genre of inquiry that explicitly aims toward both scientific and practical goals, simultaneously. Theoretical understanding is generated throughout the cyclic process of identifying, developing, implementing and evaluating educational innovations that address real problems in practice. Design research often also contributes to knowledge production among those participating. While such local professional development is viewed in some studies as a fringe benefit, it often constitutes a third, planned goal. In relation to each of these three goals, standards can be identified. Specifically, the quality of educational innovations are measured by how well they address the problem identified, and the degree to which the innovations are usable. Theoretical understanding is considered valuable when reliable and valid insights describe, explain, predict and/or prescribe action in ways that address lacunas in existing scientific knowledge. While professional development can be limited to personal understandings, it is considered particularly worthy when it engenders professional experimentation and visibly contributes to improved performance. The stance taken in this contribution is that (1) the standards to be adhered to must be set in accordance with each goal of the initiative; and that (2) how those standards are adhered to is determined by the resources, research paradigms and especially methods present. The presentation includes several examples from design research studies to demonstrate that it is the goals and paradigms, not actor types (e.g. practitioner researchers), that determine standards in practice-oriented research.

Boundary practices in design science research in vocational education

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This contribution focuses on a specific form of practice-oriented research, namely educational design research (EDR). In earlier research, we argued that design research in educational sciences necessitates balancing three different motives and accordingly, three different practices: (1) educational research, (2) educational design, and (3) educational change (Akkerman, Bronkhorst & Zitter, 2013). This contribution builds on the above by taking the concept of ‘boundary practices’ into account. The sociocultural differences between the three practices may give rise to discontinuities in interaction and action, in which case participants are faced with boundaries. Though facing boundaries can prove challenging, boundaries also have learning potential (Akkerman & Bakker, 2011). The findings show that we were able to distinguish and characterise the three practices. We also found that the sociocultural differences between these practices gave rise to discontinuities, leading to boundaries that participants have to face. Across these boundaries, different boundary practices could be identified. Taking multiple practices and the boundary practices involved as main perspective to study practice-oriented research will help to open up the black-box and make such research efforts more transparent. Opening up the black-box will contribute towards answering the questions central to this symposium: What is the nature and methodology of practice-oriented research? and Which methodological principles would this line of research involve?

Practitioner-based research in schools? Collaboration is the key message

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Many educational reports state that there is a gap between educational research and educational practice. For a long time, we can find a plea in the literature for a more intense collaboration between educational researchers and practitioners. In this presentation, we discuss the findings of a project set up in 16 Dutch secondary schools with the goal of facilitating the development and systematic study of bottom-up innovations. Throughout the project, school teachers and leaders were expected to learn together with educational researchers how to design and implement innovations, and investigate the merits and outcomes of these innovations. Main idea behind this project is that school-based innovations should be directly linked with practitioner-based research. In other words, practitioner-based research is seen as a scenario to bridge the gap between educational research and practice. In our presentation for the EAPRIL-symposium, we will focus on which conditions support and/or hinder collaboration between practitioners and researchers while working together in practitioner-based research projects. Our findings are based on a qualitative case-study with four schools. Our key finding is that practitioners and researchers need to develop a joint vision on the nature of the research study, including realistic expectations on the goals, questions, and outcomes of the study. This conclusion questions the methodologies for doing practitioner-based research. This means that future practitioner-based research projects should be grounded in research designs that have a foundation in clear, equal and high-quality collaborations, and that evaluations of practitioner-based research projects should have a focus on these collaborations.
Conceptual understanding and procedural knowledge in mathematics: Developmental trends and interplay

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The development of mathematical proficiency requires children to acquire both conceptual understanding of key concepts and procedural knowledge of efficient strategies in diverse mathematical domains, including addition and subtraction. To fluently solve additions and subtractions, children need to understand the numbers, number relations and characteristics of the addition and subtraction operation, as well as know various strategies that can be applied on these problems. For instance, 62-59 can be efficiently solved using subtraction-by-addition (59+?=62, answer 3) when children have sufficient knowledge of the numbers, the inverse relation between the addition and subtraction operation and the subtraction-by-addition strategy. Unfortunately, our insight in the development of children’s conceptual understanding and its relation with their procedural knowledge is still limited. This symposium brings together four empirical contributions that focus on the development of key concepts in the domain of addition and subtraction and its interplay with the acquisition of procedural knowledge. The different contributions address this major issue from diverse viewpoints, paying attention to both the developmental relations between different concepts and the interplay between conceptual understanding and procedural knowledge. The four studies bring together diverse research methodologies, including microgenetic and cross-sectional designs, experimental methods and clinical interviews. They provide new insights in the development of and interplay between conceptual understanding and procedural knowledge across diverse age groups, ranging from 5- to 14-year-olds. The four contributions are discussed by an expert in the field of the development of conceptual understanding and procedural knowledge, Michael Schneider (Trier University).

The interplay of conceptual and procedural knowledge in young children’s arithmetic

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The present study focuses on analysing how 5-6 year old children utilise knowledge of procedures and knowledge of concepts when developing strategies for solving a multiple-step addition task. A qualitative case study was combined with a micro-genetic approach to data collection to explore the procedural and conceptual changes that occur in children’s pre- and post-success problem solving behaviour when children solve the same type of task more than once. Clinical interviews were conducted with 10 5-6 year-old children in a series of individual problem solving sessions. Two cases are presented in this paper to illustrate the type of procedural and conceptual changes that occurred. The analysis of children’s overt problem solving behaviour reveals a dynamic interplay between children’s developing representation of the task, improved, in terms of effectiveness, procedures, and their gradually more explicit grasp of the conceptual aspects of their strategies. The
findings offer new insights about specific aspects of the ‘iterative’ model hypothesis and contribute to theoretical discussions about the need to consider different qualities of knowledge (such as knowledge explicitness) when studying the interrelations between procedures and concepts in arithmetic. The need for educational approaches and tasks that encourage and trigger the interplay of different types of knowledge in young children’s problem solving is highlighted.

Numerical magnitude processing and individual differences in children’s multi-digit subtraction

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Previous research converged to the conclusion that numerical magnitude representations are crucial for successful mathematics achievement. One major drawback of these studies is that they mainly investigated mathematics performance measured by general standardized achievement tests. We therefore examined the association between individual differences in conceptual understanding of numbers, i.e. numerical magnitude representations, and multi-digit subtraction in the number domain up to 100. Studies have shown that children apply various strategies to mentally solve multi-digit subtraction problems. One example is the subtraction-by-addition strategy (solving 72-67 as “how much do I have to add up to 67 to get 72?”), which is an efficient way to do subtraction when the two operands are close to each other. This determination of the proximity of these two numbers may depend on numerical magnitude representations. All children completed a number comparison and number line estimation task, both symbolic and nonsymbolic, which all tapped into numerical magnitude processing. We additionally administered a multi-digit subtraction task, in which half of the items were specifically designed to elicit subtraction-by-addition (e.g., 82-77). Correlational analyses revealed significant associations between numerical magnitude processing and multi-digit arithmetic. In general, results suggest children with better numerical magnitude processing to perform better in solving the subtraction problems. This is especially the case in items for which the use of subtraction-by-addition is expected based on a rational task analysis. Furthermore, the association is observed for both symbolic and nonsymbolic numerical magnitude processing tasks, but with stronger association for the symbolic format.

Conceptual understanding of complement principle and its relation with subtraction by addition

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Subtraction problems of the type M, S = ? can be mentally solved by means of various strategies, including the subtraction by addition (SBA) strategy in which one determines how much needs to be added to the subtrahend to get to the minuend (e.g., 75−43=? by ‘43+30=73 and 73+2=75, so the answer is 30+2=32’). Several studies have shown that adults use this strategy frequently and efficiently. Children, however, hardly report it. The lack of conceptual knowledge about the addition/subtraction complement principle (i.e., if a − b = c, then c + b = a) has been put forward as a potential source for children’s scarce (reported) use of this strategy. In the present study, we investigated this relation. We administered three tasks to 67 third- and fourth-graders, two of them focusing on the conceptual understanding of the addition/subtraction complement principle and one on the use of the SBA strategy. Both verbal and non-verbal data were collected. Most children showed conceptual understanding of the addition-subtraction complement principle, but hardly any of them also reported the SBA strategy. Moreover, only in fourth grade significant positive correlations were found between the measures of conceptual understanding and the use of SBA. So, it seems that the lack of conceptual knowledge of the complement principle is not a principal explanatory factor for children’s scarce use of the SBA strategy. We will discuss the theoretical, methodological, and instructional implications of these results, and definitely focus on the intriguing differences between the verbal and non-verbal types of data on both types of tasks.

Children’s understanding of addition and subtraction concepts

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Children’s understanding of additive concepts is a critical aspect in their development of mathematical skills and knowledge (National Mathematics Advisory Panel, 2008). Most research on children’s arithmetic concepts however has focussed on one or two concepts at a time and this needs to be changed (Prather & Alibali, 2009) in order to develop a more comprehensive model of the development of conceptual understanding and to devise effective instruction. To fully understand how children’s understanding of additive concepts develop, there is a need to investigate how several concepts develop over time and how they develop in relation to one another. Participants in Grades 3 through 7 were asked to solve commutativity (a+b=b+?), identity (a-1=?),
negation (a-a=?), equivalence (a+b+c=a+?), inversion (a+b-b=?), and associativity (a+b-c=?) problems and asked to provide their solution strategies to determine whether they used conceptual understanding to solve the problems. Results with Grade 3 to 5 students indicate that although conceptual understanding increases across development, there are also marked individual differences in the patterns of conceptual understanding. For example, some children (even in Grade 3) understand all the concepts but the most difficult concepts were equivalence (understanding that the total on each side of the equal sign must be the same) and associativity (understanding that subtraction can precede addition). Data collection is currently underway with Grade 6 and 7 students to more fully examine the development of these concepts.

Collaboration between pedagogical staff in contexts of diversity and professional development

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Collaboration has become a prevalent issue for schools. From a socio-constructivist background, changes of schools within a changing society require collaborative learning processes between pedagogical staff. An increase of heterogeneity (e.g. in relation with migration or inclusive school settings) and professional approaches for school development lead towards more differentiated functions of pedagogical staff, and therefore a need for coordination. On the other hand, teachers have individual responsibility for their classes, and collaboration can be a tricky task. Teacher collaboration is still a young research field, about which we do not yet know so much. This symposium aims to shed light on processes, activities, and beliefs respecting collaboration in educational contexts of change and professional development: Fussangel and colleagues analysed processes of collaboration between class teachers and pedagogical staff in newly implemented all-day schools in the context of a reform in German primary schools. Vainikainen and colleagues as well as Kreis and colleagues focus on aspects of collaboration in inclusive school settings. Vainikainen et al. surveyed local solutions of multi-professional collaboration in the context of inclusion in Finland. Kreis et al. present a study which shows the range of activities of and between regular teachers and special education teachers in inclusive schools in Switzerland. Dalehefte and colleagues focus on teacher collaboration in the context of a professional development program which aims to foster teaching quality in science and mathematics in primary schools (SINUS).

Cooperation between teachers and pedagogical staff in German primary schools

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Cooperation between different professions in schools is a relatively new research field. In Germany, it emerges in the course of developing all-day schools. One important aim of this reform is to support children and their learning. Additional pedagogical staff was hired to support teachers and for extracurricular actions. In this context we investigate whether inter-professional cooperation of teachers and pedagogical staff is successful with respect to fostering individual children. We refer to a socio-cultural perspective on learning, meaning that teachers and pedagogical staff in primary schools share their knowledge and together develop lessons and remedial offers. As research questions will be investigated: (1) How do teachers and pedagogical staff cooperate with regard to remedial actions and the tracking recommendation? (2) How do teachers and pedagogical staff define their area of responsibility? The study consists of a quantitative and a qualitative part (the latter will take place in 2013). We developed questionnaires for teachers, pedagogical staff and school leaders that focus on cooperation and the joint development of remedial lessons and the tracking recommendation. At present, we are collecting the sample. The study will take place late 2012 and early 2013. In August 2013, we will present the results of the first quantitative survey.

**Multiprofessional collaboration in enhancing educational support in Finland**

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A new Special Education Strategy was launched by the Ministry of Education in Finland in 2007, introducing a three-tier support model that emphasized preventative multi-professional student welfare and teacher collaboration. The aim of this study was to evaluate how multi-professional collaboration is understood in Finnish municipalities and how it is realized in schools. Curricula from 65 % of the Finnish municipalities were analyzed to find out how organizational structures affect school-level practices, assessed through a nationally representative principal questionnaire study. Understanding of differences in collaboration practices was deepened in a case study of seven schools. The results indicate that there are geographical and structural differences in organizing multi-professional collaboration despite of the fact that student welfare work is defined by legislation in Finland, and some models seem to function better than others. Besides differences in structures, the case study shows that collaboration is understood and realized very differently also in similar surroundings. Collaboration is experienced generally positively by teachers, however ‘forced’ cooperation seem to produce more stress than gains. The results of this study will be reflected against
Mapping collaborative activities in inclusive school settings – types of educational teams

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Following policies for equality, children with special needs are increasingly taught in inclusive classes. This involves additional pedagogical personnel who complement the work of regular teachers. Thereby, activities of inter-professional collaboration are expected to be relevant for the quality of the learning environment. However, there is only little empirical research on collaborative activities in inclusive settings. This contribution is part of a descriptive multi-methods study which focuses on activities and role perceptions of special education teachers and regular teachers in inclusive primary schools in Switzerland. We aim (a) to describe prototypical activities of regular teachers and special education teachers who work in inclusive school settings and (b) to show to what extent these activities are collaborative. Reports about activities regarding students with special needs by special education teachers (N=11) and regular teachers (N=27) who share students, so-called ‘educational teams’, were collected with an online journal during one week. A first step of analysis results in activity matrices for each participant. In a further step, individual reports were aggregated in activity maps which give an overview of the activities of each educational team. In a later workshop, activity maps were validated with participants and extended for the whole school year. These extended activity maps are compared and searched for patterns, producing a typology of educational teams. Results show a structured overview of individual and collaborative activities in inclusive school settings. Findings help to bridge a research gap and give insights which can be useful for professional development.

Fostering Cooperation in Schools - Professional Development Program SINUS for Primary Schools

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SINUS for Primary Schools aims to enhance the quality of science and mathematics instruction in primary schools. It is a professional development (PD) program whose implementation is coordinated and evaluated by the Leibniz Institute for Science and Mathematics Education (IPN) in Kiel, Germany.
SINUS for Primary Schools invites teachers to find suitable solutions for problems and to reflect on the results. According to the SINUS concept, teachers cooperate both at the school level and with other schools. An important research goal of the program is to evaluate how well cooperation works and to quantify the importance of cooperation for teachers who participate in the program. This paper focuses on responses to online questionnaires from principals (N=332) and teachers (N=1662) about how they experience the cooperative work in their own school and with participating schools. Data provide detailed information about factors facilitating or inhibiting cooperative work. In addition, teachers’ reports (online documentations) from a selected school sample (N=50) are used for in-depth studies of how cooperation is implemented within schools. It seems that cooperation develops and strengthens over time, depending on activities like sitting in on classes or reflecting on instructional materials. Results show that cooperation that functions well plays an important role in how teachers perceive the program work and engage in it. This study illuminates the importance of positive cooperation for teachers’ PD and identifies important conditions for successful cooperative work within and between schools.

How to be(come) an innovative teacher? The role of teacher factors as well as school conditions.

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Aims of the symposium. In line with the conference theme, teachers should not only prepare learners for exams, but for being open minded and developing own ideas. To accomplish this, teachers also need to be open to new ideas and innovation processes that also effect school development. Up to now, research focuses especially on teacher learning in the context of teacher professional development programs. The aim of this symposium is to present recent quantitative and qualitative research findings on the role of individual as well as school-related factors for teacher professional development and innovation processes in schools. For that reason, the symposium includes contributions which provide an in-depth look at pre-service and in-service teachers’ beliefs, interests, basic needs and regulation strategies as factors contributing to teacher learning, their motivation to engage in school innovation and proactivity as regards school development. Moreover, results on school climate and principals’ leadership will highlight the importance of school conditions for successful professional development of teachers and their engagement in school development. Scientific and educational relevance. Research on teacher learning lacks knowledge about individual and school-related factors contributing to teachers’ motivation to innovate and to their own professional development. This symposium provides both a multifaceted perspective, considering broadly applicable findings with respect to teacher learning and school innovation as well as detailed consideration of individual and school-related factors. In this way, the symposium contributes evidence-based examples for answering the question of how to become and be an innovative teacher and points to directions for future research.
The influence of individual factors on teachers’ motivation to engage in school innovations

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Innovative teachers are persons who are willing to take part in school innovations. In this contribution we focus on teachers motivation to involve in school innovations like ‘Education for Sustainable Development’. To examine the question which factors influence the motivation to deal with this innovation we focus on individual factors like interest and the perception of autonomy, competence and relatedness, as well as the application of strategies like planning, monitoring and evaluation. For that reason, we asked teachers working at schools involved in a project-structure which was established to transfer the innovation. There were teachers who were involved in this project (n = 82) and who were not (n = 60). We conducted regression analyses on each group with the individual factors. Results show that independent of an involvement in a project structure teachers of both groups deal with the relevant innovation content. Beside this, the evaluation of the innovation-related work as a metacognitive strategy supports the motivation of involved teachers, whereas not-involved teachers have a benefit from planning their innovation related work and the feeling of relatedness. The perception of autonomy surprisingly has negative effects on their motivation. These results will be discussed on the basis of the question of the symposium, how teachers become innovative.

How to develop innovation competencies in pre-service teacher education?

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Educational research lacks knowledge of how teachers become innovative and self-regulated learners. In Germany, national standards have been approved, which also focus on the development of innovation competencies in pre-service teacher education. In the study presented, a mixed-methods approach was applied by collecting quantitative and qualitative data. Quantitative data were collected to investigate in what areas teacher candidates and beginning teachers (in the second teacher training phase: ‘Referendariat’) possess innovation competencies and how individual beliefs and traits predict these competencies (N = 365). The results showed that both groups perceived having overall low theoretical knowledge about the standards and low practical experiences. For both groups higher innovation competencies were found with significant higher values for beginning teachers. Individual beliefs (e.g., perceived relevance of life-long learning) and traits (e.g., openness) predicted innovation competencies. After the quantitative study a qualitative study was applied to discuss the empirical findings with regard to implementing the development of innovation competencies in pre-service teacher education. Qualitative findings of three interviews with
international experts in the field showed e.g., that the organization of teacher education programmes should to be renewed to provide pre-service teachers with capacities to experience innovations as well as to develop innovation competencies close to professional teaching practice.

**Teachers’ proactive behavior for school development: on teacher self-regulation and school conditions**

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A core domain of the teaching profession is to engage in school development. Activities in this field are hardly formally regulated and rely mainly on teachers’ proactivity. To date, there is little evidence on contributing factors for teachers’ proactive behaviors as regards school development. Drawing on research on organizational citizenship behavior, we investigated whether teacher-level factors (i.e., time pressure, self-regulation) as well as school-level factors (principals’ leadership, school climate) contribute to teachers’ proactive behaviors as regards school development (frequency of cooperation, ratio of time in committees, ratio of training courses spent on the topic). Data from 1,939 teachers and principals of 198 schools were included in a multilevel analysis. On the school level, we combined aggregated teacher ratings as well as principal ratings. Results on the teacher level showed that high levels of time pressure do not per se hinder teachers’ proactive behaviors. Teachers who counterbalance time pressure with increased effort cooperate more frequently with their colleagues on school development. Teachers, however, who show a greater tendency to give up cooperate less frequently and devote fewer of their training courses to school development. At the school level, ratios of teachers’ time in planning committees and the frequency of cooperation in school development were linked to a school climate characterized by high staff interest in professional training. This was, in turn, positively shaped by human resource oriented principals. We conclude that teachers, staff, and principals need to be addressed as the three key players for school development and innovation.

**School organizations matter: An analysis of school conditions for successful professional development**

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This study explores the structural and cultural school organizational conditions necessary for successful professional development, teacher learning, and innovations. Most PD studies neglect these conditions or only take them into account as co-variables, often resulting in an underestimation or misconception of the key role they play in the success or failure of PD and
innovations. In an analysis of PD projects in 12 secondary schools, involving 85 teachers and 12 school leaders, it is shown in detail how those structural and cultural school organizational conditions determine the success or failure of those projects. A main issue in most schools is the dominance of teaching in relation to professional development in terms of for instance time, priority, urgency, and support.

Stereotypical beliefs related to STEM courses and studies: cross-cultural differences?

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Despite the reasonable science proficiency levels of students in most Organisation for Economic Co-operation and Development countries, schools seem to fail to interest students in science-related careers. As a response to European agreements aimed at increasing students’ entry in science, technology, engineering, and mathematics (STEM) studies in higher education, the governments of many European countries attempt to increase the number of students enrolling in these disciplines. In addition, they seek to reduce the imbalance between men and women within this sector. However, negative attitudes, including stereotypical beliefs regarding STEM subjects, influence students’ perceived suitability of particular studies or careers. Ample literature suggests that students do not see the utility of physics for their own future and consider mathematics as being too demanding and difficult. They consider STEM studies as being uninteresting, too much technology-driven, and narrowly focused. The purpose of this symposium is to bring together four studies from three different European countries that each has investigated STEM stereotypical beliefs and preconceptions from their own perspective. Particular attention will be given to the cross-cultural differences to evaluate similarities and dissimilarities among the countries regarding these issues. In each paper, suggestions for further research and implications for policy and educational practice are discussed. The four papers reveal that, despite differences in measurement, stereotypical beliefs related to the STEM field exist in both Germany, Switzerland and The Netherlands. Bringing these four papers together and finding quite similar results stresses the need for cross-cultural comparisons in the future.

Role of parents in adolescents’ decisions regarding a career in science

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Many policy makers and researchers in science education see a lack in interest in school-science as one of the primary reasons why young people are not interested in science careers. This is in line with previous research, which has focused student’s interest and self-concept as most important
factors for adolescents’ career considerations. However, the questions, how students’ interest in science may optimally be increased, and why many talented students with high interest in science do not study science, are still partly unanswered. The main purpose of this work is to promote discussion about parents’ role in adolescents’ career choices regarding science; we open up perspectives how family factors may be modeled when explaining students’ career considerations. The expected effects are tested on a sample of high-achieving German students participating in the Program for International Student Assessment (PISA) (N=549). Our conclusion is; focusing on family context is important in order to be able to understand how students’ interest in science, self-related cognitions in science and deliberations about science-related careers are established.

What accounts for women’s career decision-making in the STEM field?

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In Switzerland, career decision-making in the STEM area is still strongly gender-stereotyped. The aim of this mixed methods study was to understand whether female academic high school students intending to study STEM during different phases of their career decision-making process eventually pursued their goal. Results from the first longitudinal study (N=481) revealed that female students who intended to choose a STEM discipline were persistent in their choice during the transition from high school to university. They demonstrated better competence in mathematics, placed more importance on investigative activities in their future job and showed lower gender-stereotypical beliefs related to mathematics than other students. However, they presented their self-concept in mathematics as rather low. Findings from the second study based on a sample of 295 female students attending a science program shed light on the importance of the students’ passion for mathematics and their affinity for technical sciences. In the third study (N=631), female high school students interested in engineering had more learning experiences in this area and weaker stereotypical perceptions of mathematics as a male-dominated domain than students who were interested in natural sciences. This paper discusses implications for K-12 classroom science learning and teaching.

Stereotypes, self-concepts and gender specific career choices in the STEM field

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Stereotypes, particularly those of parents and teachers, can have a big influence on pupils’ career dispositions. STEM (sciences, technology, engineering, and mathematics)-careers have a very unequal distribution between females and males. Stereotypes regarding STEM careers can have a crucial impact on pupils’ career dispositions: They may prevent gifted females from taking a STEM career but they also may also encourage males to choose an inappropriate career option and cause drop-offs. This paper investigates pupils’ perceptions with respect to STEM careers based on a qualitative and a quantitative study. The qualitative study investigates pupils’ perceptions of
cognitive, socio-cultural and motivational aspects that are important to choose a STEM career. The quantitative study looks into the issue, how far stereotypes influence females’ and males’ self-concept regarding STEM and how far this affects career decisions. Results of the qualitative study show a high influence of parental support for career aspirations in STEM, particularly by the support of toys, tasks and talks about STEM careers. The quantitative study could reveal negative correlations between stereotype views and STEM related self-concept both, for males as well as for females. Yet, regarding correlations between self-concept and career aspirations for STEM it could be revealed that they are much higher for girls, which means that females need a much higher self-concept than boys to decide for a STEM career.

**Preconceptions of science-oriented studies in Dutch higher education**

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In this study, students’ preconceptions of science-oriented studies (STEM) in Dutch higher education are investigated. In the Netherlands, few students are enrolled in STEM studies as compared to other Western European countries. Students’ preconceptions of these studies can be biased, based on invalid or selective information. If student advisors and teachers are aware of this, they can use this information in providing better counselling. The present study included 1,629 students who had not chosen a STEM study in higher education, but enrolled in other studies such as medicine, law, or economics. A questionnaire was sent to the students to investigate their preconceptions of both science and technical studies. Our main finding was that Dutch higher education students’ preconceptions of technical studies were more favourable than their preconceptions of science studies. Moreover, the overall preconceptions of STEM studies were in fact not particularly negative, despite the fact that these students had not enrolled in a STEM study themselves.

**Approaches to the Strategic Use of Multiple Theories to Research Teaching and Learning**

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Australia

David Clarke  
The University of Melbourne  
Australia

Stephen Lerman  
London South Bank University  
United Kingdom

Each of the research projects described in this symposium has purposefully employed multiple theoretical lenses within the one research design. Each presentation addresses a different aspect of the question: What are the challenges and benefits of using multiple theories within a single study to promote our understanding of learning and teaching? Presentation One (Clarke) draws on three major multi-theoretic projects to frame the theoretical and methodological issues central to multi-theoretic research studies. These issues include: (i) the role of theory in determining not only the form of analysis but the construction of the data to be analysed, (ii) the principles under which any two parallel, but theoretically distinct, analyses can be combined or connected, and (iii) the purposes that might be served by such multi-theoretic research designs. In Presentation Two (Chan), parallel analyses explore and contrast different emphases in approaches to early literacy, and, in particular, demonstrate that nomothetic and idiographic explanations are not necessarily mutually exclusive in
practice. Presentation Three (Berge and Ingerman) describes the strategic use of theories in a stratified analysis in which each theory is invoked selectively as the focus of analysis shifts. The three analytical perspectives employed are complementary rather than commensurable, because they are not referring to the same data, even though the data they reference is derived from the same event. Presentation Four (Xu and Tytler) puts into practice the principle that theoretically distinct analyses of the same events can provide insight into both the events and into the theories guiding the analyses.

**A less partial vision: Approaches to multi-theoretic research design**

David Clarke  
University of Melbourne  
Australia

This presentation examines different approaches to multi-theoretic research through comparison of (i) the ad hoc analyses undertaken in the Negotiation of Meaning study (Clarke, 2001) with (ii) the parallel analyses accommodated but not prescribed in the study design for the Learner’s Perspective Study (LPS) (Clarke, Keitel, & Shimizu, 2006), and (iii) the results of the Causal Connections in Science Classrooms study (CCSC) generated by the explicit designation of the theories to be employed for analysis, where data generation could specifically target data types aligned with the intended analyses (Clarke, Xu, Arnold, Seah, Hart, Tytler, & Prain, 2012). The additional question posed in this first presentation concerns the methods and legitimacy of synthesizing each set of multi-theoretic analyses into a coherent portrayal and whether the synthesized findings transcend the insights offered by the individual mono-theoretic analyses. Each theory brings with it a vocabulary that privileges certain constructs and downplays or ignores others. In considering the legitimacy of such a synthesis, I suggest that the determining constraint is not the compatibility of the theories, but of the interpretive accounts generated by their application to a common representational record of classroom events. Multi-theoretic research design promotes a form of reciprocal interrogation, where the analyses provide insights into the practices of the research setting and the comparison of the analyses facilitate the reflexive interrogation of the selected theories. This presentation identifies both benefits and concerns related to the use of multi-theoretic research designs.

**An investigation of multiple perspectives in early literacy: Implications for research and teaching**

Esther Chan  
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Australia

This paper investigates the different portrayals of early literacy resulting from different theoretical analyses. The responses of 293 four to six-year-old children to a set of early literacy assessment tasks were analysed using quantitative and qualitative methods at group and individual levels. A comparison of the findings suggests that different ways of processing and analysing the data reflect different assumptions about the nature of early literacy, and could lead to distinctive portrayals of early literacy. Results from item response modelling suggest that early literacy development is sequential and hierarchical, while thematic analysis indicates that children’s early literacy understanding is diverse and meaning-situated. At the individual level, some children with the same ability estimates appear to have approached the early literacy assessment tasks in different ways, supporting the idea of multiple developmental pathways. The combined findings support the premise that research and assessment are intrinsically interpretive. The theories that researchers and practitioners use to generate knowledge about the world (epistemology) influence the kinds of information that are considered as evidence and the inferences that are made about the evidence. This paper argues for the need to critically examine the theoretical lenses used in early literacy assessment to support teaching.
Triple vision in different theoretical spaces – exploring physics jokes in small group discussions

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We have used multiple theoretical spaces as an analytical strategy when researching learning possibilities when engineering students discuss physics together. Three different theories were purposefully applied in a series of stratified analyses. Level one employing phenomenography and variation theory, level two using positioning theory and level three making use of the techniques of conversation analysis. Having done this, we wanted to explore to what extent a phenomena in one theoretical space is visible in other theoretical spaces (but not naturally focused on) and what it in that case looks like. The students’ jokes are one such example, which were also important part of the students’ conversation. Our analysis illustrates how one joke is observable through all three analytical lenses. The three analytical lenses are linked to three different theoretical spaces, even when it is linked to the same original event. The lenses have become advantageous in different ways: the lens of conversational analyses assists in discerning the joke, the lens of position theory provides clues about the cultural context and the lens of phenomenography and variation theory informs us of the learning possibilities that are related to the jokes. In this paper, we propose and demonstrate that these three analytical perspectives are complementary rather than commensurable, because they are not referring to the same data, even though the data they reference is derived from the same event.

Distributed cognition and representational perspectives on a classroom sequence about matter

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A range of theoretical perspectives on learning fall broadly into a socio-cultural, Vygotskian orientation, but involve different constructs and focus on different aspects of the learning context. This paper compares two distinct analyses of the same lesson sequence on matter. The focus of the distributed cognition analysis is on the way artefacts are employed by the teacher and students to mediate learning. The focus of the representational analysis is on the possibilities for student generation and coordination of representations opened up by the teacher. Both perspectives identified problems in the way resources were coordinated by the teacher and construed by students. However, the distributed cognition perspective identified a lack of common meaning attached to the physical and conceptual artefacts around which the lessons were planned, whereas the representational analysis identified problems of negotiation and coordination of different semiotic modes. The two theories thus offer distinct perspectives on teaching and learning, together providing a richer interpretation of the sequence than either on its own. It is argued that such an analysis, utilizing a common data set, allows us to better understand the particular affordances of each theory and how constructs sit in different relation to each other within the two theories.

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Self-assessment is both a crucial learning strategy and a skill that learners need to develop for the formative assessment and the self-regulation fields. In this symposium the papers will question current practices and conceptions of self-assessment from differing empirical approaches and theoretical perspectives and provide suggestions as to how to better understand what lies under and beyond self-assessment. The first paper will address issues of accuracy of self-assessment, one of the central topics in the field. Data comes from a synthesis review of 84 international studies and recommendations will be made on how to increase accuracy based on cognitive processes. The second paper will explore the relationship between self-assessment and long-term learning through the concept of sustainable assessment. Teachers’ conceptions of self-assessment and its implementation will be presented and how these conceptions affect the issues of power in self-assessment implementation in higher education. The third paper analyzes how different self-assessment models conceptualize discourses of assessment in terms of power relations. This will be done using metaphors and cognitive mapping to reveal power dynamics in assessment that are usually implicit and argues teachers are not sufficiently informed to be able to reflect about the implications of these models. In the fourth paper the real application of self-assessment in classroom will be explored. Data coming from 1500 primary, secondary, and higher education teachers will be presented analyzing the different perspectives and uses of self-assessment to clarify the need for more specific recommendations from the formative assessment field and how to implement this in real classrooms.

Valid self-assessment: Problems novices and low progress learners have in judging their work well

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Formative assessment policies argue that student self-assessment of work products and processes is useful for raising academic performance. This view draws on self-regulation of learning theories about setting targets and evaluating progress against criteria as a basis for meta-cognitively informed improvement of learning outcomes. However, the reliability of assessment is necessary for the validity of assessment interpretations. Research into psychological processes underlying the human ability to self-evaluate work raises serious doubts about the quality of students’ judgments. It has been shown that novices (i.e., students) tend to lack sufficient knowledge by which to evaluate their own work appropriately and, when possessing that knowledge, they are likely not to make use of it. Additionally, psychological safety factors indicate that self-assessment can be compromised by
interpersonal relations present in classroom environments. Furthermore, since progress in many educational domains is relatively ill-defined, it is difficult for learners, let alone instructors, to validly evaluate progress or status. A recent review of studies in elementary and secondary schooling (K-12) found that the correlation between self-ratings and teacher ratings, between self-estimates of performance and actual test scores, and between student and teacher rubric-based judgments tended to be positive, ranging from weak to moderate (i.e., values ranging from $r \approx .20$ to .80), with few studies reporting correlations greater than .60. However, these values were not consistent across student experience and academic proficiency, with much less accuracy seen with younger and less proficient students. Suggestions as to raising the accuracy of self-assessments derived from the literature will be presented.

**Student self-assessment that sustains formative assessment for long-term learning**

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Formative assessment is said to enhance learning, but it is not always clear whether such enhanced learning refers to the immediate learning that arises from feedback on a specific assessment task, or on longer term learning beyond a programme of study. In the short term, formative assessment practices require students to understand assessment standards in order to act on teachers’ feedback. Students require ability to judge their own learning in order to benefit from formative assessment practices. Such self-assessment by students focuses on the formative potential of the present assessment task, but does not necessarily develop nor sustain their ability for their own future learning needs. Sustainable assessment may be understood as ‘assessment that meets the needs of the present without compromising the ability of students to meet their own future learning needs’ (Boud, 2000). Formative assessment that is sustainable should enhance students’ capacity for long-term learning beyond the context of immediate assessment practices. My position is that a different conception and practice of student self-assessment is required for formative assessment to sustain long-term learning beyond immediate assessment tasks. A study of academics’ conceptions of student self-assessment revealed different agendas and outcomes of using student self-assessment practices as a form of formative assessment. One of the three conceptions student self-assessment identified by this phenomenographic approach was labelled the future driven conception of student self-assessment. This conception generates useful insights into developing and sustaining students’ self-assessment ability in ways that enable learners to sustain their learning beyond their course of study.

**Metaphors of assessment: situating the power dynamics of learners and tutors**

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With socially situated learning theories (Vygotsky 1978) at the fore and developments in cognitive sciences, our understandings of learners and learning have taken dramatic turns, especially in the past 20 years. Within learner and learning-centred discourses, self-assessment and Self-Regulated Learning are increasingly considered basic requirements and goals. Metaphors of communication, which are ingrained in our psyche and thinking (Harrison 2004) are a good vantage point for examining the power relations in assessment. This is particularly relevant since current thinking focuses on the centrality of dialogic feedback linking tutors and learners (Merry et al., 2013). This conceptual paper contextualises discourses of assessment, particularly within five self-assessment models, within understandings of metaphor and cognitive mapping. Using research on networks of metaphors of communication as a starting point, it evaluates three aspects of metaphor in the
assessment literature: firstly, word meaning and concepts inherent within them; secondly, visual, pictorial metaphors; and thirdly, entailments. This paper discovers a number of contradictions and anomalies between our linguistic legacies (relatively slow-moving networks of fixed metaphors), and conceptual understandings inherent in terminology and politico-social beliefs. It finds variable access of students to empowerment, with the standard self-assessment model potentially further disenfranchising students and tutors. An explicit understanding of these power dynamics will enable us to better understand our assessment processes and decide if we really want to put learners at the heart of learning and teaching and what we must do to ensure this.

Self-assessment from teachers’ point of view: How it is implemented in primary, secondary and H. Ed.

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Formative assessment is one field in educational psychology that has received increased research attention recently. There are solid theoretical and empirical foundations for how formative assessment can be implemented successfully. Nevertheless, it seems to be an area that deserves more attention: are the formative assessment principles being applied in real classroom settings? Self-assessment is a key concept in formative assessment. To explore this matter over 1500 primary, secondary and higher education teachers completed a survey covering self-assessment as well as other aspects of formative assessment. The survey showed that self-assessment is frequently carried out in real classrooms, albeit differently across educational levels, and that teachers who use it are satisfied. However, more than half of the teachers considered that students are not accurate when self-assessing. The conclusions are that (a) teachers did not perceive a direct relationship between maturity and accuracy of self-assessment, (b) self-assessment that affect its success at different educational levels, and (b) although they did not consider students were accurate, teachers still valued the pedagogical use of self-assessment. It is recommended that formative assessment researchers should look for different success features in the implementation of self-assessment across educational levels.

Learning to see; Perception, cognition and technology development in the professions

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In many domains, professional performance depends upon one’s ability to understand complex visualizations. Although this ‘professional vision’ is often described as pattern recognition the complexity of both the underlying learning process and of daily practice are only partially understood. Many of the structures and processes professionals deal with are invisible to the naked eye as they are too small, too far away or hidden from observation. Consequently, modern professionals use visualisation techniques to make the invisible visible. What started with straightforward X-rays has now evolved to dynamic X-rays (fluoroscopy), multi-slice exams (CT-scans), and functional magnetic resonance (fMRI). These resulting images may look deceptively similar to the familiar images such as photographs, but their interpretation requires many complex cognitive and perceptual skills. The sheer amount of information generated by these new techniques requires new skills from those working with them, requires users to understand the technologies used to generate them and may require complex representational skills such as coordinating three dimensions of display or fine discrimination of fast moving images. Thus the goal of this symposium is to explore the difficulties that novices face when learning these new skills and technologies, highlight the performance of skilled practitioners and generally increase our understanding of ‘learning to see’.

Development of visual and cognitive expertise; The case of clinical pathology

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For many contemporary professions, the examination of complex visualizations is crucial: think of air traffic control, airport security, or meteorology. Although research into such visual expertise has become more widespread since the introduction of eye tracking technology, the teaching of this expertise to newcomers remains a relatively unstudied phenomenon. This is also true for highly visual medical specializations, such as radiology and pathology. The exponential increase in imaging techniques has caused a parallel growth in images to be examined. In addition, these visualizations have become more complex. This study investigates both the visual and cognitive expertise development of clinical pathologists. By doing so, difficulties for clinical pathologists with different expertise levels are determined. This knowledge can be used for more effective training of
newcomers in this highly visual domain. Participants include 38 clinical pathologists with three different expertise levels, who performed diagnostic tasks on a digital microscope. Stimuli included 10 microscopic images: 5 high, 5 low magnification images. Eye movements, verbal explanations, and performance data were analysed. Results showed integration of cognitive and perceptual skills in problem-oriented knowledge structures of intermediates and experts, while novices (trained medical students) did not show this. They had more difficulty finding the relevant areas in high magnification images, used less sophisticated, and more descriptive instead of interpretative terms for what they found in the images, and reasoned in a less goal-oriented way, leading to a lower diagnostic accuracy.

The role of biomedical and biomechanical knowledge when ‘learning to see’

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In the medical profession, biomedical knowledge (facts about (ab)normal functioning of the human body) forms the basis for expertise. This study investigated the role of biomedical knowledge in learning to examine information-dense, dynamic medical images (fetal ultrasound). Therefore, 33 medical students with biomedical knowledge background were compared to 44 human-movement science students with a knowledge background in the biomechanics of human movement. All students learned to examine the ultrasound videos in a computer-based learning environment, which taught the distinction of two types of fetal movements: isolated vs. general movements (i.e., complex movement patterns of several body parts). Results showed that in total isolated movements were more difficult to examine than general ones. To understand this finding, analyses on subscales of test performance were calculated. Again, no main effect of knowledge background was found. A main effect of movement type revealed that detecting which body parts are involved in isolated movements is slightly easier than for general movements. Describing movement speed and amplitude, however, is more difficult for isolated than general movements. Moreover, an interaction effect showed that medical students draw better conclusions on the (ab)normality of the movement for general than for isolated movements, while for human-movement science students it is the reverse. These findings indicate that while biomedical knowledge enables students to learn to draw conclusions from complex movement patterns biomechanical knowledge of human movement allows better judgment of simpler, isolated movements. Hence, it may be worth to consider both forms of knowledge in the medical curriculum.
Expertise effects in eye movements and detection performance while viewing dynamic medical images

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The present eye movement study investigated the role of expertise and presentation speed on detection performance and eye movement behavior in dynamic medical images. The goal was to determine how differences in performance as a function of expertise relate to eye movement behavior. The dynamic scenes were 9 videos of CT-scans (Computed Tomography scans) from the upper to the lower part of the abdomen. Six of the videos included general abnormalities and three of them included enlarged lymph glands (ELG) on top of these. Three did not contain any abnormalities. Expert radiologists, semi-expert radiograph nurses, and laymen students were instructed to detect ELG’s and other abnormalities in the CT-scans while their eye movements were registered. The CT-scans were presented with a frame-rate of 7, 14 or 28 slides per second. All participant groups indicated to be least comfortable with the highest speed, even though presentation rate did not affect detection performance. Eye movement behavior of experts was fundamentally different from that of the other groups. First experts made more fixations of shorter duration, increasing the chance that no lesion will be missed. Second, they were, unlike the other groups, very adaptive in their eye movement behavior, making for instance shorter saccades (jumps with the eye) when subtle lesions appeared. Third, their eyes were more often in areas where lesions may appear. Taken together, it can be concluded that eye movement behavior can clearly reveal whether an expert radiologist is at work or somebody with less detailed knowledge about CT-scans.

Learning to See: The Case of Functional Magnetic Resonance Imagery

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Functional Magnetic Resonance Imaging (fMRI) has become a standard technique for researchers and the visualizations that result are frequently seen in the popular media. Such visualizations are
known to influence people's interpretation of the credibility of research results. However, they are not photographs and require complex perceptual and cognitive skills if people are to decode them correctly. This study compared expert and novice verbal protocols as they interpreted three different cases of varying credibility. These protocols were transcribed, segmented and then coded with NVivo to identify knowledge states and interpretation processes. Analysis revealed striking differences between the two groups. Experts used their detailed knowledge of neuroanatomy to interpret what they saw and use the software systematically to reveal patterns of activations. Novices frequently became lost amongst the 3 views, were attracted to perceptually salient structures and as a result used software in ways that did not reveal subtle features. A final key difference was that experts were more sensitive to the errors and artefacts in the visualizations whereas novices were far less critical treating them as transparent and straightforward, even in the extreme case when activation was shown outside the brain.

The effect of classroom quality on children's language and literacy skills in the early school years

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Increasing evidence indicates that high quality of classroom interactions in the early years contribute to children’s later learning and development. The U.S. studies using the CLASS (Pianta, LaParo, & Hamre, 2008) observations have shown that the quality of emotional and instructional support and classroom organization in preschool and kindergarten classrooms is associated with child development. Comparative reports on the quality of observed teacher-student interactions and their effects on children’s skill development in the European context are, however, more rare. This symposium contains four papers drawing from recent large-scale early childhood studies using a range of methodologies and conducted in the Netherlands, Estonia, Belgium, Portugal, and Finland. The Dutch study investigates the contribution of high quality early childhood education and care for 2-year olds to children’s language development at age 3. The comparative study between Estonia and Finland explores the benefits of different preschool practices for children’s literacy skills development at the first school year. Another comparative study examines whether classroom quality at Grade 1 predicts literacy skills similarly in Belgium and in Portugal. Finally, the study from Finland focuses on the effects of classroom quality at Grade 1 on the children’s reading skills development. The papers of the present symposium add to previous research by showing differences and similarities in key findings of studies carried out in diverse educational systems. The symposium also aims to address the issue of why improving the quality of teacher-child interaction in classroom should be a priority in early childhood.

Effects of ECEC quality on children’s language development in the preschool years

Pauline Slot
High quality Early Childhood Education and Care has been linked to positive language outcomes for young children. The present longitudinal study, PreCOOL, examined the effects of quality of Dutch preschool and day care centers on children’s language development between two and three years of age. Classroom quality was assessed using the Classroom Assessment Scoring System for Toddlers (CLASS Toddlers; La Paro, Hamre, & Pianta, 2011) when children were two years old. Children’s receptive language development was assessed at two and three year of age using the PPVT (Dunn, Dunn, & Schlichting, 2005). The first findings indicate that overall quality was predictive of children’s gains in vocabulary. More specifically, observed Emotional and Behavioral Support was predictive of better language skills among three-year old children when controlling for language skills at age two and children’s ethnicity. No associations were found for Instructional Support. Results indicated differential effects for different types of ECEC provisions.

Is it important to begin reading instruction before school entry in transparent orthographies?

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Previous studies have shown that reading acquisition is relatively fast among children learning to read in a language context of highly transparent orthography. The present study compared the development of literacy skills in two transparent languages, Estonian and Finnish, during the first school year. In Estonia decoding skills are taught already in preschool, whereas in Finland formal literacy instruction begins only after children enter the first grade. The sample consists of 298 Estonian and 353 Finnish first grade children. Children’s literacy skills were assessed at the beginning (phonological awareness, letter knowledge, and word reading) and at the end of first grade (fluency and comprehension). The findings indicated that although pre-reading and word reading skills were better among the Estonian school beginners, by the end of the first grade reading fluency was slightly better among the Finnish children. At the end of the first school year the mean levels of reading comprehension were similar among both groups of children but the proportion of poor comprehenders was higher in the Finnish sample. The findings suggest that in languages with
transparent orthographies, early onset of reading instruction (i.e., during preschool rather than at the beginning of first grade) does not guarantee subsequent success in reading development at school. In future studies, other factors that may have long-term effects on children’s reading development (e.g., classroom quality and instructional elements) should be examined.

**Classroom process quality and literacy skills in Portuguese and Belgian first grade classrooms**

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Understanding factors associated with children’s early skills is of vital importance to children’s later school success. Accumulating evidence points to the role of two key classroom processes: teacher-child relationship quality and classroom climate. Warm and close relationships have been associated with positive school adjustment, whereas high levels of conflict have been linked to adjustment difficulties. Positive emotional climate and a well-organized classroom, in particular, are relevant for children’s learning outcomes. Despite this growing body of research, thus far few studies have provided comparative data on the quality of classroom processes and their links with literacy skills across countries. The present study, examined, first, the measurement invariance of classroom climate using the CLASS (Pianta, La Paro, & Hamre, 2006) and student-teacher relationship quality using the STRS (Pianta, 2001) in Portuguese and Belgian samples. The second goal of the study was to investigate whether classroom process quality predicts literacy skills similarly across these two countries after taking relevant background variables into account. Participants were 158 Portuguese children (45% girls) and their teachers from 105 first grade classrooms and 197 Belgian children (52% girls) and their teachers from 35 first grade classrooms. The results indicated that the presuppositions for measurement invariance (equivalence of factor structure and factor loadings) held to a large degree for both classroom process quality using the CLASS and student-teacher relationships using the STRS. Moreover, the findings suggested that literacy skills can be supported by sensitive and responsive interactions with teachers both in Portuguese and Belgian classrooms.

**The role of teacher–child interactions in the development of reading skills at the first grade**

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Helena Rasku-Puttonen
A considerable body of literature indicates that high quality teacher-child classroom interactions effectively contribute to children’s learning and academic achievement in the early school years. This study examined the extent to which teacher-child interactions observed in Grade 1 classrooms, class size, child’s gender, and mothers’ education predict the development of children’s reading skills. The reading skills of 1,029 Finnish children (523 boys) were assessed at the beginning and end of Grade 1. The Classroom Assessment Scoring System (CLASS; Pianta et al., 2008) was used to observe classroom teachers on their quality of emotional support, classroom organization, and instructional support in 29 classrooms in the Spring of Grade 1. The results of multilevel SEM showed, first, that mothers’ education explained part of the variance between classrooms in reading skills at school entry. Second, smaller class size predicted higher quality teacher-child classroom interactions. Finally, the results showed that high quality emotional support, classroom organization, and instructional support contributed to beneficial development of children’s reading skills during their first school year. The present study adds to the previous literature by showing that in the first grade classrooms with an emotionally warm and supportive climate and individualized instruction, children show greater reading skill development during the academic year than in lower quality classrooms.

Metaphors about Teaching and Learning: Revealing and Changing Teachers’ Beliefs

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Teaching beliefs or conceptions are one major factor influencing teachers’ practice (e.g. Pajares, 1992; Kember, 1997; Trigwell & Prosser, 1996). Therefore, teacher training needs to address (academic) teachers’ conceptions of teaching in order to improve the quality of teaching (e.g. Akerlind, 2004; Wubbels, 1992). Assessing and changing implicit beliefs is a challenging proposition. Metaphors guide the understanding of the world around us (Lakoff & Johnson, 1980) and have been proposed as possible access to teachers’ conceptions (Pajares, 1992; Wubbels, 1992). Consequently, metaphors have been used as a tool both for assessing as well as for changing conceptions of teaching (e.g. Saban, 2006), especially in teacher education. However, research based on metaphors about teaching and learning is still scarce: The symposium aims at exploring how metaphors can be used to assess multiple aspects of teachers’ conceptions, both in secondary and higher education, and what they reveal about teachers’ conceptions: What do metaphors reveal about teachers’ identity as a teacher? What do they tell us about their conceptions of teaching? How do they change...
during professional development? How do teachers respond to metaphors, and which scope has their response? What do drawings tell us in comparison to oral expressions of metaphors? These and other questions will be addressed and discussed in the symposium.

Metaphors of teaching at different stages of the teaching career

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Teachers’ beliefs play a significant role in classroom activities. Metaphors offer a possibility to stimulate teachers to explicate their beliefs. In our study we investigated which conceptions of teaching were visible in teachers’ drawings and how teachers’ beliefs vary at different stages of their career. We interviewed student teachers at the (a) beginning, (b) middle, and (c) end of their studies, as well as (d) beginning and (e) experienced teachers. Altogether, 50 interviews were analyzed by content analysis. Four different categories of beliefs were found: transmission, construction, nurturing, and participation. Student teachers at the beginning of their studies tended to view teaching as nurturing or as transmission, whereas student teachers in the middle of their studies preferred the view of teaching and learning as construction or as participation. However, teachers with extensive professional experience showed a belief pattern similar to beginning student teachers. These results indicate that teacher education does not effect lasting changes in teachers’ beliefs.

Metaphors as a tool for eliciting teachers’ beliefs on teaching and learning

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Metaphors were used as a tool in this study to help teachers explicate their beliefs about teaching and learning. We asked secondary teachers from diverse schools and subjects to respond to a range of metaphors and analyzed their responses both in terms of language and content. We found that metaphors elicited diverse responses from different teachers and that metaphors elicited both small and broad views on teaching and learning. Small views were characterized by a focus on a single aspect of learning or teaching and broad views were characterized by a focus on several aspects of the teaching and or learning process. A variety of metaphors was necessary to complement teachers’ views.

Similarities and differences of metaphors in visual and verbal descriptions of teacher identity

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The aim of the paper is to explore through what kinds of metaphors in their drawings and verbal descriptions academics express themselves as teachers, i.e. their teacher identity. Research focusing on academics’ teacher identity has been relatively scarce, and most of the studies have applied traditional qualitative research methods like interviews and biographies. In the current study, we explore how the drawings and verbal descriptions differ in terms of agency, context, activities and artefacts and how the affective aspects are expressed through metaphors. The findings indicate that whereas the verbal descriptions are limited mainly to the teacher, and allows for a more nuanced description of emotions and activities, drawings allow for a broader interpretation of being a teacher including artefacts, students and contexts as important elements contributing to how one perceives of oneself as a university teacher.

Academics’ metaphors of teaching and learning between knowledge acquisition and enculturation

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Learning can be conceptualized as both, a process of acquisition of knowledge, scripts and schemata (acquisition metaphor of learning), and as a process of becoming a member of a community of practice (participation metaphor of learning). Academics’ conceptions of teaching and learning have been described as varying between a student- or learning-orientation and a teacher- or teaching-orientation. These conceptions or beliefs are a major factor influencing the way teachers approach teaching and respectively student learning. Metaphors have been proposed as possible access to both teachers’ explicit and implicit beliefs. Therefore, we aimed at analyzing academics’ metaphors about teaching, what they reveal about academics’ conceptions of teaching, and which impact professional development programs have on these conceptions. In our first study, we analyzed 36 academics’ teaching conceptions based on their metaphors, resulting in four categories (transmission, construction, apprenticeship and community growth). In a second, longitudinal study (N=8) we found that academics after one year of academic development had either developed more sophisticated conceptions about teaching or had retained the same, according to their teaching metaphors. The results indicate that academic development can positively influence participants’ conceptions of teaching. Metaphors are suggested as a useful tool for professional development to stimulate academics’ reflection about their teaching beliefs in the light of different perspectives on teaching and learning. In such a reflective process, the shift towards more student-centered and enculturation-sensitive conceptions of teaching becomes possible. This shift, in turn, may improve teaching quality in tertiary education and foster sustainable learning.

Fostering Mathematical Competencies in Kindergarten and Early Grades

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Recent years have seen a welcome increase in research activities on the nature of mathematical learning and mathematical learning disabilities (MLD). Several studies have shown the evidence of knowledge about numbers in pre-school as a prerequisite for the development of mathematical learning. Additionally, problems with fact retrieval and, as a consequence, persistent (finger) counting strategies are known as a marker MLD. There is a broad consensus that young children and children at risk for math learning difficulties should be assisted by prevention and intervention programs. The symposium will present studies about intervention programs in kindergarten (Rechsteiner and Toll) and for children with mild intellectual disabilities (Brankaer) and persistent counters in early grades (Wittich). Thereby, the questions of whether, how, under what conditions, and for which group fostering of mathematical skills is successful are of special interest.

A numerical domino game and magnitude processing in children with mild intellectual disabilities

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Because number sense, or the ability to represent numerical magnitudes, play an important role in children’s mathematical development, the present study aimed to develop and evaluate an intervention to enhance numerical magnitude processing in children with mild intellectual disabilities (MID). As these children appear to have particular problems in understanding the numerical meaning of Arabic digits, we developed a numerical domino game that specifically targets the association between these digits and the numerical magnitudes they represent. We investigated the effects of this game by means of a randomized pretest-posttest design. Participants were 30 children with MID (M = 8.36 years), randomly assigned to either the numerical domino game (n = 15) or to a control color domino game (n = 15). Both groups participated in eight 15-minute intervention sessions and their performance on numerical magnitude comparison and arithmetic was measured before and after the intervention. Findings revealed that playing the numerical domino game led to improvements in children’s response speed on the magnitude comparison tasks and in the number of correctly solved addition problems, while playing the control game did not have this effect. When comparing the advantages of the numerical domino game to the color domino game, especially children’s reaction times for symbolic comparison improved. These findings suggest that numerical magnitude processing can be successfully trained in children with MID.

Fostering early mathematics with games: Outcomes, mathematical activities and interaction
It is the aim of this intervention study to compare the effects of two different approaches to early mathematics with a control group: a training program (Krajewski et al., 2008) and a newly developed play-based approach (Hauser et al., 2010). In particular, it is of great interest which method (training or play-based) is suitable for children with high, medium and low precursory mathematical skills. Pre- and Post-tests (Moser & Berweger 2007) measured the numeracy skills of the six years old children (n=325), video-based observation provides insights into the mathematical activities of children with either low, medium or high mathematical precursory skills when playing board and card games. The results of the interventional study show a significant effect for the play-based approach compared with the control group. No significance could be found for the training. The analysis indicates that all children, regardless of their precursory skills benefit from the play-based approach. In order to understand the learning processes involved in the play-based approach, a theoretical sample of 12 sequences was chosen for detailed video analysis, involving a popular game and groups of low, medium and high precursory skills. Results of the video analysis show that children with high precursory skills use more elaborate strategies have higher confidence in counting and make fewer mistakes than children with low precursory skills.

Remedial education in early numeracy for kindergartners scoring below average

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Children at risk for math learning difficulties should be assisted by prevention programs with a focus on early numeracy. The present study aims to test the effectiveness of a remedial early numeracy program for kindergartners scoring below average. The features and the content of the program will be presented. Another purpose is to evaluate the role of child characteristics such as working memory in the measured growth. 1040 children (538 boys) were followed at six time points from halfway through the first year of kindergarten until the end of first grade (2.5 year). All participants completed a standardized early numeracy test at the first time point. The children with a score below average (N = 410) were matched on school level and randomly assigned to one out of three conditions: intervention (N = 155) or control (N = 150). The third condition is disregarded here (N = 105). The intervention group was offered the remedial program for 1.5 year (92 small-group sessions of 30 minutes). The results of the first four time points (from pretest to posttest) were
analyzed using latent growth modeling using structural equation modeling. These analyses showed a significantly faster development of the intervention group compared to the control group and a significant effect for both visual and verbal working memory on the initial value of children's early numeracy competence.

Development of non-counting computational strategies: A longitudinal study in grades two and four

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Students with mathematical learning disabilities (MLD) often have problems with fact retrieving and rely on persistent counting strategies. To acquire mathematical skills on a higher level and for successful computation, students require efficient strategies which support the relational understanding of numbers and basic operations. With a longitudinal study, it was evaluated, whether it is possible to foster the use of non-counting strategies with an intervention. A sample of 143 persistent counters (126 second graders and fourth grades from special education needs classes was randomly assigned to three experimental groups: individual-structured learning (n=38), peer-learning (n=58), control group (n=47). The groups were matched by mathematical achievement, IQ, age and gender. The intervention was conducted in two thirty-minute sessions per week by the teachers with the entire class over a period of 10 weeks. An ANOVA shows a significant interaction effect between time and intervention for the post-test and follow-up. This effect was influenced by the improvement of the students in peer-learning condition. However, no significant difference between the groups was found in the post-hoc test (Scheffe). A regression model with the AV ‘mathematics achievement’ in the post test shows a significant influence for previous knowledge (mathematic achievement in t1), IQ and the peer condition. However, this effect couldn’t be found for the follow up. These results indicate that it is possible to foster non-counting computational strategies, but with some restrictions.
This symposium proposal comprises four papers that focus on different aspects of research on young
children’s mathematical conceptual development. The authors use diagnostic tests (MARKO-D-series) with
the same theoretical basis of a developmental model of mathematical concepts. The series was
designed and implemented originally by a scholars in Germany and Switzerland. The central
argument of the symposium is that it is necessary, in a global community, to share testing
instruments across borders. By the time international survey instruments such as the TIMMS, the
PIRLS and the PISA are administered across countries, the opportunity to look at the development of
younger children has passed, and with that too the opportunity to introduce suitable remedial
action. The symposium argues that the MARKO-D series, which is based on a conceptual
developmental model, can fill some of the void in the area of assessment of young children, including
children from the Global South. Such tests can serve to show how young children develop in many
similar ways in their understanding of mathematical concepts and that they have much in common
across cultural, national, geographic and linguistic borders. For the South African education policy the
test may be of great value to assess, nationally, not just the delivery of the national curriculum as is
currently the case, but the specific developmental level of young children at a time when much can
be done to assist them in appropriate interventions.

A Developmental Stage Model for Arithmetical Development in age 4 – 8

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Annemarie Fritz, Antje Ehlert & Lars Balzer University Duisburg-Essen (Germany), Federal Institut,
Zollikofen (Switzerland) A common theme of conceptualizing competence and developmental
models is finding hierarchical structures of abilities, which can be interpreted as developmental lines
or sequences. Such a developmental sequence would allow researchers and teachers to allocate
every child to a certain developmental level of conceptual understanding. The developmental model
that we describe is an effort of doing such modeling with its empirical coverage, concerning
arithmetical learning for children aged four to 8 years. Based on literature and empirical results
concerning central concepts in arithmetical learning, the following six level model was created (Fritz,
Ehlert, Balzer, in press): Level I: The ability to distinguish small sets and to count and enumerate
themLevel II: The ability to name the predecessor and successor of a given number on some kind of
mental number line and to solve small addition tasks by counting or using the number word
sequenceLevel III: Understanding the connection of number and set in a concept of cardinal number
Level IV: The part-part-whole concept, organizing the knowledge of breaking and assembling
setsLevel V: The understanding of congruent intervals between the numbers of the number line
(relational numbers)Level VI: understanding that units of two, three and tens are always of the same size.

Cognitive Development, Concept and context

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The empirical and theoretical work referred to in this paper will have been discussed by the three
preceding ones in the symposium. In those papers the authors explained (1) the conceptual,
developmental model on which the mathematics competence test (the MARKO D) is based, (2) the
validation of the test, (3) as well as aspects of its implementation in three additional languages. In this paper the focus is on some of the linguistic barriers that had to be taken into account and that continue to need attention for future use of the instrument. The version of the test that will be discussed is the isiZulu one specifically, pointing to the complexities of the meanings of words in different parts of speech across languages. In the first pilot studies in South Africa, the English translation had to be converted from its very formal discourse to typical school discourse, and then translated into the African languages discursive practice of education. Added to the levels of complexity, was the use of formal and informal versions of isiZulu and the common urban dialect, isicamtho. For the wider use of the test in South Africa further pilot studies with larger samples will be undertaken to examine the translations.

A study of cross-linguistic latent trait dimensionality

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The dearth of instruments in South Africa that test the development of mathematical concepts reliably makes the hierarchical model of the Marko-D particularly important to not only assessing mathematical competence of foundation phase learners, but also to designing the appropriate interventions for improving development. Our pilot studies suggest the Marko-D may in time prove to be a valid and reliable instrument for testing mathematical competence in three South African languages; English, isiZulu and Sesotho. Our analyses indicate that while certain items are indeed affected by the process of translating the instrument from German to English and then to isiZulu and Sesotho, the latent trait of the Marko-D appears to be measured in a way that is comparable to the German model. A good translation that has gone through repeated iterations with various translators and language experts can maintain the conceptual basis of a latent trait. Due to the accurate translation we are finding that children in South Africa, whether they speak English, Sesotho or isiZulu, respond to the items of the test in a way that is consistent with responses elicited from German children. Our evaluation of goodness-of-fit suggests that the items of the test are, for the most part, unaffected by the double translation, which is testament to the rigor with which the latent trait of the instrument was initially conceptualized, defined and measured.

Longitudinal Study of Development of Mathematical Concepts: Validation of a Developmental Model

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We analyzed, whether the model described in the first paper of this symposium can be replicated in a longitudinal study. A sample consisting of about 250 children was tested. As provided in our study design these children were assigned to a mathematical weak or average competence group. The data were be Rasch-analyzed. The used diagnostic tests measured the acquisition of mathematical concepts in grades 1 - 3 (MARKO-D test series). The analysis shows that the model can be confirmed on the basis of longitudinal data. The implications are that the test can now be used more widely, especially since its English translation (see paper 3 and 4 of the symposium) can be translated to other languages more easily than the German version, as soon as that version can also be validated in the same way Fritz, A. & Ricken, G. (2008). Rechenschwäche. Stuttgart: UTB. Fuson, C. K. (1988). Children’s Counting and Concepts of Number. Berlin: Springer. Resnick, L. B. (1983). A Developmental Theory of Number Understanding. In: Ginsburg, H. P. (Ed.): The Development of Mathematical Thinking. New York: Academic Press, 109-151. Ricken, A., Fritz, A. & Balzer, L. (in
Dynamic testing in the cognitive domain: new methods and cultural diversity

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Dynamic testing originates from dissatisfaction with the use of conventional, static tests as measures of cognitive functioning and their limited value for educational or clinical prescription. In contrast to static testing, in dynamic testing, children are typically provided with feedback, prompts or training enabling them to show individual differences in their progress when solving cognitive tasks. In general, minority children with different cultural or ethnic backgrounds score lower on tests of cognitive abilities than do children from the dominant culture. There is increasing evidence however, that this bias can be reduced by using dynamic tests, where specific interventions are integrated into the testing process, leading to change of performance and thus allowing for estimation of cognitive potential and modifiability. In most forms of dynamic testing, it is assumed that children during training learn to engage in the processes needed problem solving, and that the intra-individual variability in effective use of these processes at posttest is indicative of children’s learning capacity. Fine-tuned measuring, however, is not always available in cognitive testing. In the various contributions, two facets have a central position: 1. dynamically testing minority children by using the most evidence based dynamic testing forms; and 2. studying outcomes of process-oriented computerised and other advanced forms of dynamic testing, such as electronic tangible materials and eye movement measures. Comparisons will be made between findings from dynamic and static testing in groups of children with various cultural backgrounds. In more detail, changes in individual solving- and learning strategies will be presented.

Assessing cognitive functioning in preschoolers with/without a migration background

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The ACFS is a dynamic test for preschool children (format: test - training - test) with the ‘core tests’ ‘classification’, ‘auditory’ and ‘visual short term memory’, and ‘pattern completion’. It was used in a conjoint sample of children from Spain and Germany (n=226), with both subgroups including indigenous and migrant background children. Results based on general linear model analyses showed significant pretest - posttest gains throughout and only very slight differences between the two residence groups. Also, children with or without a background of migration proved to be significantly different in level of ACFS- performance. Importantly, the intra-group interaction of migration status and effect of mediation (pre-post) was not significant. Additional analyses differentiating between migrant children in Spain without and with a linguistic Spanish background showed that the latter group improved comparatively more in Auditory Memory and ACFS, Total. The ACFS thus seems to be appropriate for assessing children who increasingly come from different linguistic and cultural backgrounds. Language competencies may be a factor that influences improvement of performance after mediation in these children.Keywords: dynamic testing, cultural bias, cognitive functioning, measuring change.

Dynamic testing of ethnic minority children’s cognitive potential

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Dynamic testing is a method to assess cognitive potential in which training is incorporated into the assessment process. This type of assessment appears especially effective for measuring cognitive potential in disadvantaged populations such as ethnic minorities in culturally diverse school populations. Ethnic minorities on average score lower on cognitive ability and achievement tests than their peers from the dominant culture. In contrast, dynamic assessment studies have shown similar outcomes for both indigenous and ethnic minority groups. In this study we extend previous findings and attempt to delve deeper into the question of whether dynamic testing of analogical reasoning is suitable for multicultural assessment. This study investigated whether the dynamic test outcomes obtained with AnimaLogica, a dynamic test of figural analogical reasoning, were moderated by ethnicity (40% ethnic minority) or training-type: graduated prompts (N=290) or feedback (N=201) in 5-10 year-old children attending inner-city schools in the Netherlands. In addition, the interactions of ethnicity with age, fluid reasoning ability, working memory and school achievement on dynamic testing performance were investigated using explanatory item response theory models. The results and implications of the findings will be presented at the conference.Keywords: multicultural assessment, cultural bias, figural analogies, measuring learning and change

The validity of a dynamic measure of analogical reasoning evidenced with eye movement registration

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We recently used a computerized version of the Hessels Analogical Reasoning Test (HART) to evaluate changes in problem solving behavior of children with and without learning difficulties as a result of training. In dynamic assessment, it is generally assumed that children learn to engage in the processes needed for analogical problem solving during training, and that the intra-individual variability in effective use of these processes at posttest is indicative of children’s learning capacity. This assumption is based on the observation of augmented scores at posttest in the trained group. Eye movement data made it possible to show that training indeed incited children to engage in the appropriate problem solving processes. At posttest, the children showed more structured inspection patterns, more ‘intelligent’ comparisons and spent more time encoding the information in the matrix, thus confirming posttest construct validity. In the present study, we applied the same procedure in a group of 60 adolescents with mild intellectual disabilities, aged 15 to 18, using a pretest-posttest-control-group design. HART items were revised for these participants. Experimental and control groups were matched on mental age, measured with Raven’s SPM, and the HART pretest measure. The aim is to show that the improvement in the experimental group is to be attributed to the training and not to mere test repetition, and that participants with intellectual disabilities will use ‘real’ analogical reasoning at posttest, whereas inappropriate strategies are used at pretest.Key Words: Dynamic assessment, learning potential, eye movement, construct validity, learning.

Dynamic testing with electronic tangibles: culture-independent progression in series completion task

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In dynamic testing, children are provided with feedback, enabling them to show individual differences in progress when solving tasks. Recently, dynamic testing procedures have been developed from the perspective that educational testing should not be focused on learning at the moment it occurs. Utilizing graduated prompting training designs is assumed to offer opportunities to get insight in how learning processes occur and vary within and between individuals, and groups of children with different ethnic-cultural backgrounds. Interfaces using concrete materials, combined new technology and based on cognitive task analyses, are assumed to have much potential in the setting of dynamic testing. Key objective of our study was to examine progression in outcome variables and strategy use. We examined how a form of process-oriented dynamic testing, using electronic tangible materials, and incorporating a series of graduated prompts and scaffolds, could provide insights into children’s potential for learning. Second grade children (N=72) were given series completion tasks. The study employed a pretest-post-test control group design with two training sessions between pre-and post-test. Special attention will be paid at the dynamic testing procedure with electronic tangibles, including graduated prompts training, at the outcomes for experimental and control-subgroups of children, and at progression of strategy use into a more advanced level. Comparisons will be made between findings from dynamic and static testing in the various cultural groups of children. In more detail, changes in individual solving- and learning strategies will be presented. Key words: dynamic testing, potential for learning, culture, strategy development, electronic tangibles, seriation

Responsible teaching in mathematics education

Anna Sfard
Considering mathematics as a social practice (Cobb, 2006), where students act as legitimate participants within a community of learning (Lave & Wenger, 1991), it is important to create times and spaces in which sustainable mathematics learning meets daily life experiences and students’ cultures (Cimar, in press). But sustainable learning in formal educational settings cannot exist without a responsible teaching (Cimar, 2009; Cobb & Jackson, in press), and this requires significant improvements in classroom practice for most teachers such that they engage students in mathematical activities, allow them to appropriate (mathematical) knowledge, and develop (mathematical) competencies. Teachers require sustained support to use the mathematics curriculum to foster students’ engagement in diverse and fruitful work (Stein, Engle, Smith, & Hughes, 2008), reflect on choices regarding instructional materials (Stein & Smith, 1998), and establish a coherent didactic contract that promotes learning opportunities and equity in the access of school achievement and social inclusion (Cimar; 2009; Cobb & Hodge, 2011; Machado & Cimar; 2012). The learning demands on teachers as they develop instructional practices of this type indicate the importance of school leaders, teachers, and other stakeholders assuming joint responsibility for instructional improvement. In a very real sense, improving the quality of instruction is a problem of organizational as well as teacher learning. In this symposium, we will share, compare, and contrast examples of how responsible teaching and sustainable learning in mathematics is being developed in different countries.

Knowing students’ mathematical abilities and competencies to promote meaningful learning experiences

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Mathematics assumes an important role in students' trajectories of participation, in and outside schools (Cicsar, in press). Students participate in different cultures and show particular reasoning, solving strategies, and informal mathematical knowledge (Cicsar, 2009). To promote a responsible teaching, teachers must know which abilities and competencies students mobilize and those they must develop. Knowing this since the beginning of the school year allows them to adequate their practices, including the nature of the tasks, promoting students' access to mathematical cultural tools (Cicsar, 2009; Machado, Cicsar, & Matos, 2011). This study regards an instrument to evaluate students' abilities and competencies (IACC), elaborated by the Interaction and Knowledge (IK) team, whose main aims were studying and promoting collaborative work in formal educational scenarios. The IACC is composed by five tasks each one regarding particular abilities and competencies. We assumed an interpretative approach (Denzin, 2002) and developed an intrinsic case study (Stake, 1995). The participants were the students participating in the IK project (5th to 12th grades, 10/11 to 17/18-year-olds, around 600 classes from all over Portugal and Cape Verde), 69 mathematics teacher/researchers, and four psychologists. Data was collected through the IACC, questionnaires, tasks inspired in projective techniques, interviews, informal conversations and students' protocols. Data was treated through a narrative content analysis (Clandinin & Connelly, 1998) from which developmental patterns emerged. Some examples of students' solving strategies regarding Tasks C and E illuminate how the results from the IACC shape teachers' practices, contributing to a responsible teaching and facilitating students' sustainable (mathematics) learning.

Creating co-learning in a community of inquiry between teachers and didacticians

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We report from seven years of (longitudinal) research in Norway in which didacticians of mathematics in a university worked with teachers in a range of schools, lower primary to upper secondary, to promote better learning environments for students in mathematics. Two projects, Learning Communities in Mathematics and Teaching/Learning Better Mathematics took place in sequence. Both were undertaken from a community of inquiry (Wells, 1999) perspective and sought to create co-learning environments (Wagner, 1997) through critical alignment in practice (Jaworski, 2006). Central to the projects was an inquiry-based developmental research approach in which didacticians and teachers together developed knowledge in practice. Both brought specialised knowledge from their established communities of practice (Wenger, 1998) and each learned from the other as the project community developed. Both acted as insider researchers, exploring critically their own practice and feeding back to the project in a variety of ways. Didacticians collected data from all events and conducted rigorous analyses, mainly qualitative. Data included recordings from project meetings and classrooms, interviews and focus groups, a variety of documents and students' test papers. In this paper, we outline areas of theory underpinning the project and discuss knowledge growth for the two constituent groups drawing on research outcomes. In particular we address focuses on mathematics and differing ways of viewing the teaching of mathematics by didacticians and teachers; ways in which didacticians and teachers learned about each other's perspectives and practices and moderated their own views in consequence; the slow rate of development and its potential for sustainability.

Supporting instructional improvement on a large scale: Coordinating professional development
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This paper reports on a research project that sought to develop an empirically grounded theory of action (ToA) for supporting instructional improvement in mathematics on a large scale. The 200 study participants included mathematics teachers, coaches, school leaders, and district leaders from four urban districts that served a total of 360,000 students. For each of four years, we collected a range of qualitative and quantitative data to document the practices of members of each role group, the formal and informal supports for improving their practices, and to whom and for what they were accountable. This paper elaborates on one of the five components of the resulting ToA: the coordination of professional development (PD) across contexts (e.g., pull-out teacher professional development, school-based teacher collaborative time) and role groups (e.g., teachers, school leaders). Literature on professional learning and in mathematics teacher education, coupled with our findings, suggest three principles for designing PD that will support instructional improvement on a large scale. First, it appears important that PD is organized around specific, high-leverage practices and that it involves both pedagogies of investigation and enactment. Second, it appears important that opportunities for professional learning are coordinated across contexts, such that what participants work on in one context is explicitly linked to and elaborated on in another context. Third, it appears important that PD is coordinated across role groups so that school settings can become supportive environments in which teachers can work on enacting ambitious teaching.

**Supporting instructional improvement on a large scale: Coaching, school and district leadership role**  
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This paper reports on a research project that sought to develop an empirically grounded theory of action (ToA) for supporting instructional improvement in mathematics on a large scale. The 200 study participants included mathematics teachers, coaches, school leaders, and district leaders from four urban districts that served a total of 360,000 students. For each of four years, we collected a range of qualitative and quantitative data (including video-recordings of the 120 participating teachers’ instruction) to document the practices of members of each role group, the formal and informal supports for improving their practices, and to whom and for what they were accountable. This paper reports our findings for three of the five components of the resulting ToA: mathematics coaches’ practices in supporting teachers’ learning; school leaders’ practices as instructional leaders in mathematics; and district leaders’ practices in supporting the development of school-level capacity for instructional improvement. Our findings indicate the value of coaches leading school-based meetings of groups of teachers in the course of which they press teachers on high-leverage issues. Our findings also indicate the value of a distributed model of school instructional leadership in which coaches are primarily responsible for supporting teachers’ learning, and school leaders are responsible for pressing teachers’ development of the intended instructional practices. In addition, it appears critical that district leaders in different central office units develop a shared a vision of high-quality instruction that orients their work with school leaders, coaches, and teachers.

**Fostering Historical Thinking: the Role of the Curriculum, Learning Tasks and Teachers’ Knowledge**  
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Nowadays, most scholars in the field of history education agree on the importance of developing students’ capacity to think historically. As a result, in many countries a great deal of attention has been devoted to reform the practice of history teaching towards historical thinking goals, such as the capacity of using historical knowledge and strategies to situate phenomena in time and to critically examine historical evidence and interpretations. Prior research has shown that students face a variety of difficulties when they are supposed to think historically. They often lack historical (overview) knowledge and domain-specific strategies and are inclined to reason from a present perspective. In case of contested historical topics, critical thinking and considering multiple perspectives is a real challenge. Research, however, does not yet provide much direction for fostering historical thinking. The aim of this symposium is to deepen our understanding of the role of the curriculum, learning tasks and teachers’ pedagogical content knowledge. The first paper examines the effects of explicitly teaching knowledge and skills students need to contextualize. The second paper focuses on effects of engaging Jewish and Arab students in a collaborative historical inquiry task on their shared past. The third paper addresses the role of teachers’ knowledge in the design of learning tasks that aim at historical reasoning. The fourth paper looks at the tests teachers design to assess students’ knowledge and skills.

Knowledge and Strategies that Afford Historical Contextualization

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Historical contextualization, creating a spatial and temporal context for a historical phenomenon or action of people in the past to render it more intelligible, is a component of historical reasoning. In many countries the ability to contextualize historically is considered an important aim in history education. We investigated the question which types of historical knowledge and strategies afford historical contextualization. We report the results of three studies (a process study and two experimental studies) that we carried out to gain more insight into the knowledge and strategies that enable secondary school students to build an adequate historical context for unfamiliar historical images and documents. Results show that especially a rich associative network around colligatory concepts, knowledge of landmarks and approaching the task systematically, using many clues provided by the source to generate and test hypotheses, contribute to successful contextualization.

What Historical Thinking Evolves amidst Conflict, Multi-Perspectiveness and CSCL?

Sarah Pollack
We examined the evolution in the historical thinking of 164 Israeli Arab and Jewish tenth-grade students who collaboratively investigated events from the troubled Jewish-Palestinian past in a multi-perspective computer-supported environment. We analyzed students’ essays, first produced in ethnically-homogenous pairs and then in bi-ethnic foursomes, as well as students’ discussions. We found that through e-discussions, students illuminated less elaborated angles in their interlocutors’ viewpoints, usually the ones concerning the historical agents’ accountability. Students transcended their in-group narratives though they did not abandon them. The bi-ethnic groups’ essays were constructed of bits of pre-existing narratives, put together to create a new meaning including more empathetic descriptions of each historical agent.

Teaching Pre-Service History Teachers to Design Tasks That Foster Historical Reasoning

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Teaching historical reasoning (besides content knowledge) is a challenging task for (future) history teachers. This study aims to investigate pre-service history teachers’ competence in designing learning materials that foster historical reasoning of students in secondary education. In an undergraduate course on history teaching and learning, students (N= 86) read scientific texts about history, the learning and teaching of history and educational psychology and integrated and reflected on this content in weekly learning journals. In a final, collaborative assignment, students designed two pages and assignments for a history textbook. Learning journals were analyzed on the level of students’ didactical reasoning. The (construction of) assignments were analyzed by looking at the content and the extent to which these tasks could foster historical reasoning. Results indicate that enriching pre-service history teachers’ knowledge base influenced the level of didactical thinking. However, students did not design tasks that could trigger a high level of historical reasoning.

Assessment and the Constructed Nature of Historical Knowledge: An Analysis of History Exams

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In the field of history education, developing students’ awareness of the constructed and evolving character of historical knowledge has come to be considered an important teaching goal. To investigate to what degree Flemish teachers address epistemological issues in history exams, we analyzed a set of 190 written history exams for students of the 11th and 12th grade. Only 3% of all questions (5784) in the exams deal implicitly or explicitly with epistemological or historiographical issues. The paper will present a qualitative analysis of these questions, which are classified in 5 categories, and close with a more general discussion and possible explanations.

**Personalising Learning: Enactment Insights**

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Personalising Learning: Enactment Insights Chair: Vaughan Prain, La Trobe University, Australia  
Discussant: Anthony Edwards, Liverpool Hope University, United Kingdom  
While personalising learning is broadly advocated in many countries for primary, secondary and tertiary students, strategies that enact this approach remain speculative and under-researched. In this symposium we draw together research insights from complementary studies in three countries, Australia, Sweden, and the United Kingdom, to identify challenges and effective implementation strategies, drawing on quantitative and qualitative research methods. To contribute to defining the components in personalising learning, we have devised and trialed a survey, the Personalised Learning Environment Questionnaire (PLEQ) with over 2200 low SES secondary students in a regional Australian context (see paper 1 in this symposium). In this paper we report on how several item and scale validation techniques including factor and item analyses confirmed the instrument’s sound psychometric structure. In paper 2 we analyse student responses to this survey conducted twice over two years, and case studies of attempts by teams of teachers to enact personalised learning strategies in English and mathematics. Paper 3 reports on the use of digitised technologies to personalise learning in Sweden while paper 4 discusses the teaching of skills in personalising learning in teacher advisor groups as part of an explicit school curriculum in the Australian context. Our symposium is significant in identifying explicit practical strategies for enacting this approach to student learning across a large cohort of students, as well as theorising the bases for the learning outcomes.

**The Development and Cross-Validation of the Personalised Learning Environment Questionnaire (PLEQ)**

Jeffrey Dorman
This paper reports the development and cross-validation of a new instrument, the Personalised Learning Environment Questionnaire (PLEQ). The final form of the PLEQ has 66 items assigned to 19 scales. A trial sample of 230 students from 2 country high schools was used to refine the initial version of the PLEQ. This revised version of the PLEQ was subsequently administered to samples of 2,407 students in 2011 and 2,290 students in 2012. These students were from 4 high schools in one large provincial Australian city. Several item and scale validation techniques including Rasch, factor and item analyses confirmed the sound psychometric structure of the instrument.

**Personalising learning: An Australian Case Study**

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Personalising learning is now broadly endorsed as a key process to improve student curricular engagement and academic attainment. We review claims made for this approach, as well as concerns about its conceptual coherence and effects on different learner cohorts. Drawing on literature around differentiation of the curriculum, self-regulated learning, and ‘relational agency’, we propose a framework to conceptualise and enact this construct. We then report on an attempt to introduce personalised learning as one strategy, among several, to improve student academic performance and wellbeing in four low SES regional secondary schools in Australia. We report on two surveys (2011-2012) of over 2000 students’ perceptions each year of the extent to which their school provided a personalised learning environment, and on teacher and student interviews. We found that while there were ongoing challenges for teachers and students to implement this approach of shared control and mutual responsibility for learning, there were also academic and wellbeing gains from this approach.

Enacting Personalised Learning Plans: Case studies from Sweden and Australia

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Processes to personalise learning include the development of student Personalised Learning Plans (PLPs) or Individual Learning Plans (ILPs) through negotiation with teachers (Ackerman, 2004; M€rell-Olsson, 2012), but there has been relatively limited research on their impact, or factors that influence this impact (Europeiska skoldatan€tet & Empirica GmbH, 2007; Sebba et al, 2007). In this paper we aimed to compare approaches to personalised learning taken in two regional cities in Australia and Sweden through case studies of teachers’ perspectives. The Australian study occurred within a context of ‘radical change in school organisation, teaching and learning, curriculum access and school design’ (BEP 2006 p.1) within a policy framework of attempts to strengthen teacher practice and student engagement in elementary (primary) and secondary schools. The other case study was conducted in Umeå, Sweden, where reforms in the Education Act 2008 required teachers to oversee Personal Development Plans for all elementary students, including teacher assessment of student knowledge and learning, as well as student goal-setting. We found that the digitisation of Personal Development Plans occurred in many schools in Sweden as a way to boundary teacher workload and ensure transparency of the personalised
learning process, while the take-up of personalised learning in the Australian context was more varied, with some schools developing Individual Learning Plans (ILPs) for all students.

**Personalising learning for low SES students: Linking relational agency, advocacy, and learning**

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Valerie Lovejoy  
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Australia

Research on personalised learning suggests that students are more motivated to learn when they experience some degree of autonomy in the learning process (Hargreaves, 2005). This involves a complex understanding of cognitive, meta-cognitive and affective dispositions that support or hinder learning (Meyer, Haywood, Sachdev, & Faraday, 2008). While all students benefit from an improved understanding of their own learner attributes, students from low socio-economic backgrounds may need additional support to address environmental and personal issues related to low aspirations, reduced home support and inadequate goal setting skills (Battistich, Solomon, Dong-il, Watson, & Schaps, 1995). Issues of bullying, poverty, substance abuse, health and well-being can also impinge on realisation of learner potential. This paper examines a program designed to address these issues for students of low socio-economic background in an open-plan regional secondary school in Australia. In teacher advisor groups the program introduced personalised learning skills as an explicit part of the school curriculum in order to improve student engagement and learner resilience. We found that by building ‘relational agency’ (Edwards, 2011; Prain et al., 2012) through the teacher advisor group, students experienced the additional support needed to address their learning and self-efficacy challenges in order to benefit from the personalised curriculum in open-plan settings.

**Comprehension, Judgment & The Assignment of Guilt: The Role of Visualizations in Litigation Law**

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Germany

Neil Schwartz  
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France

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Germany

The aim of this symposium is to demonstrate that visualizations influence learning and judgments of jurors in the context of litigated cases in courts of law. Jurors are individuals who are required to learn pertinent concepts of a case, much the same way as students in a classroom are required to learn concepts in, for example, physics, social studies, or math. Visualizations are used in courts of law to display evidence, explain complex events, and show trends in the context of litigated cases. The problem is that juror decision-making in the presence of visualizations is neither straightforward
nor always clear, and there is a dearth of evidence that the findings from multimedia research can be applied to litigation law. Four research teams working as visualization specialists under official agreement between the International Cognitive Visualization Program and two litigation law firms in the state of California, USA produced visualizations for use on cases scheduled for litigation in California courts. Each paper reports tests of the design and deployment of these visualizations on comprehension, judgment, and the assignment of guilt, following preliminary data collected in the lab and post-trial data when the cases go to trial between December 2012 and May 2013.

**Animating the Relationship between Text and Diagrams: Effects on Understanding and Assigning Guilt**

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isabella Glogger.  
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The aim of this investigation was to discover how manipulating the relationship between multiple representations in a specific litigation law case influences how participants understand the presented facts and how their understanding of those facts influences the degree to which they find the defendant guilty, or not. While guidelines for the proper use of multiple representations exist for learning environments (Ainsworth, 2006, Hegarty, 2011), few, if any, studies investigate the effects of multiple representations in the courtroom. In the present study, complicated guidelines for a medical procedure and related statistical information were presented via expository text along with diagrams. The relationship between the text and the diagrams was either animated, or not. We expected to find that animating and emphasizing the relationship between diagrams and text would lead to a better understanding of the presented facts that could then be used to inform the assignment of guilt.

**Effects of visualization mode and context on comprehension and decision making in litigation law**

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Sandra Becker1  
Psychology  
United States
While research suggests that visualizations usually aid in learning and understanding, this may not always be the case, as indicated by inconsistent findings on the effects of animations on learning. The present study was designed to gain insights on how visualizations, specifically, the role of animation and color, affect recall, guilt assignment, and judgment confidence in a specific litigation law case. The case that the study was based on involved the issue of exemptions in regard to California Wage laws. These laws are complicated and difficult to comprehend in their original textual form. We designed a diagrammatic visualization translating the original Wage Order into a diagrammatic visualization according to principles described by Haggerty (2011) and Mayer (2005). We sought to influence recall, guilt assignment and judgment confidence. We further investigated how the subtle use of color would influence the outcome variables as described above.

The Influence of Presentation Rate and Sequence of Visualizations on Recall and Decision-Making

Visualizations that are presented in a courtroom setting aim to facilitate comprehension, recall, and problem solving in decision-making by a jury. This study examines the possibility to heighten these goals by influencing the sequential nature and rate of presentation of certain visualization components. Study 1 compared the difference between presenting a static graphic of a simple comparison bar graph to an animated graphic guided by the year of comparison data. Our hypothesis was that if there was a violation of expectations in the data, an animated bar graph would lead to higher recall and ease in decision-making. Study 2 addressed any effects from the particular sequential presentation of data. Our hypothesis predicted that when a violation of expectations is
presented, effects are stronger when a neutral variable is first presented across all years, in order to establish a cognitive framework. Then, when the variable for comparison is presented, and violations of expectations occur, recall and ease of decision-making is increased even further due to the cognitive framework that is established. Implications for presentations of visualizations in the courtroom are discussed, as well as ideas for future research in this field.

**Color in Context: The influence of color and attribute framing on perceptions of guilt in litigation**

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Martin Galilee  
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This study seeks to answer if more positive evaluations can influence the degree to which a company is found guilty. Participants were presented with one of three texts describing a warranty violation issue. The text was framed positively (defense succeeded 60%), negatively (defense failed 40%), or neutrally (defense violated warranty), and was presented alongside either no graph, or one of five graphs representing the information in an official legal complaint. The graph was either all gray, or represented successes or failures in red or green. Participants were asked to rate the degree to which the company possessed a set of 10 positive and 10 negative characteristics and asked to rate the degree to which they found the company culpable and guilty. A behavioral measure was taken to assess if participants would purchase the company’s tires in the future. Results are expected to indicate a ‘valence consistent shift’ whereby positive framing elicits more positive evaluations than the negative frame. Results of the present study will allow for detecting possible interactions between color, attribute framing and the content represented by color.

**The role of theory in doctoral education**

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United Kingdom

Gina Wisker  
University of Brighton
United Kingdom

Margaret Kiley
CHELT
Australia

Ray Land
Durham University
United Kingdom

Research (see for example Kiley, 2009: and Murtonen, Aiston et al 2006) suggests that one of the difficulties that doctoral candidates encounter in their learning to be researchers is understanding the concept of theory. This symposium presents four perspectives on the way in which theory is portrayed in doctoral education. The first presentation specifically examines how supervisors report on candidates’ difficulties with the concept of theory and how they can be helped with this understanding. On the other hand, the second paper comes from the perspective of thesis examiners and discusses the ways in which they comment on and identify the candidate’s grasp of theory as demonstrated through the thesis. Paper three comes from the perspective of doctoral writing and how candidates demonstrate their understanding of theory through their writing. The final paper brings the whole symposium together with a discussion of the use of theory in understanding how candidates progress in their learning. Kiley, M. (2009). ‘Identifying threshold concepts and proposing strategies to support doctoral candidates.’ Innovations in Education and Teaching International 46(3): 293-304. Murtonen, M., S. Aiston, et al. (2006). Research candidates’ conceptions of theory. Quality in Postgraduate Research: Knowledge creation in testing times. M. Kiley and G. Mullins. Canberra, CEDAM, The Australian National University: 141-148.

Big theories, little theories: What happens in doctoral education?

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Research suggests that one of the difficulties that doctoral candidates encounter in their learning to be researchers is understanding the concept of theory. This paper presents research that outlines how research supervisors work with candidates who have difficulty learning about theory and its role in research, how to apply theory in their research study and to theorise their findings. Twenty-one experienced supervisors from six universities were interviewed using a semi-structured protocol. The universities represented research-intensive and more professionally oriented institutions. Ten of the interviewees were in the Science, Technology Engineering and Mathematics (STEM) areas (eight male and two female) and 11 in the Humanities and Social Sciences (HASS) areas (again with eight males but this time with three females). The interviews were digitally recorded and then transcribed and returned to the interviewee for clarification. The transcripts were coded resulting in three themes which were: difficulties candidates had with theory as observed by supervisors; difficulties supervisors had in helping candidates understand theory; and finally strategies which supervisors reported as being successful in assisting candidates.

Examiner concern with the use of theory in PhD theses

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How students use the literature and position their work theoretically is a theme that examiners typically identify in their written reports, most specifically in the categories of comment we identify as ‘formative’ and ‘use of the literature’ which often overlap. In this paper we focus on the way examiners raise the issue of theory and how important they regard it to be in the overall assessment of the thesis. This study draws on analyses of 342 PhD examiner reports on the thesis. Two measures of overall thesis quality were available: the recommendations examiners made to the candidate’s university as to the fate of the thesis they had examined, and a normative measure of quality on a 6-point scale. Examiner responses to a questionnaire concerning the importance of various assessment criteria, including use of theory, for PhD examination were also available. Illustrations from examiner comment on theory and literature use for theses of different quality will be presented and discussed.

**Doctoral writing: breaking writing blocks through understanding theory**

Gina Wisker  
University of Brighton  
United Kingdom

Most research into academic writing concentrates on writing development for undergraduates, while much research on doctoral student development looks at relationships with supervisors, communities and the doctoral learning journey. This research on doctoral student writing aims to identify conceptual threshold crossing through an understanding of theory as ways of achieving and identifying successful doctoral writing. It builds on research with doctoral students on the development and acquisition of threshold concepts and in particular the concept of theory (Wisker et al 2010), and on research into identifying and overcoming writing blocks in academic writing (Wisker and Savin Baden 2009). The research is in two parts: (1) Rescrutiny of data from the ‘doctoral learning journey’s project’ (2007-2010) into the learning journeys and conceptual threshold crossings of doctoral students in the UK across 4 discipline areas, and the ‘parallel project’ asking the same research questions of international doctoral students, supervisors and examiners. (2) New small scale qualitative research with UK and international doctoral students and supervisors exploring the development of articulacy, confidence and voice in doctoral writing, and the recognition and crossing of conceptual thresholds in the use of theory in research. In this paper the focus is on students’ understanding of theory. To date there is clear evidence of awareness of conceptual threshold crossing through doctoral writing by both doctoral students and supervisors, and further evidence of ways in which development practices can support and ‘nudge’ such articulacy for the successful achievement of doctoral research through writing.

**Using Theory to Understand Theories: Liminal Experiences and How Doctoral Supervisors Can Use Them**

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United States

Postgraduates face many challenges along the path to a doctorate. A way to understand them is through the notion of threshold concepts or conceptual thresholds, transformed understandings or perceptions of one’s journey to achieving doctorateness, resulting in ontological or epistemological shifts. Related to these challenges is the concept of liminality, a period of confusion, difficulty, or doubt as in a rite of passage. The aim of this research is to explore liminal experiences along the doctoral journey, particularly related to understanding theory, and how supervisors can use them to better support their students. The methodology used in this qualitative research was narrative inquiry, with 23 participants representing a cross-section of research and professional doctorates interviewed. Findings cut across the diversity of the participants. Liminal experiences included a lack of confidence in one’s ability, a sense of isolation, research misalignment, and a lack of supervisory
support. Periods of liminality often ended suddenly with aha moments, though these were rarely discussed, even after long periods of time. While most participants had some support around them, each still had to work through their passage on their own. These findings can provide guidance for supervisors to help their students by talking about liminal issues.

Current Insights into School Related Motivation in Diverse Student Populations

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The research presented in this symposium combines two increasingly important themes in the school context: school motivation and diversity. The symposium examines school motivation in diverse student populations drawing on empirical data from different national and cultural contexts. Gender and intellectual ability as well as family immigrant background are taken into account as these factors comprise crucial aspects of diversity. The application of current theories of motivation to specific subgroups of students constitutes an important desideratum for research as relevant empirical results are still scarce. The introductory paper will deal with autonomous motivation of students with Borderline Intellectual Functioning and the role of perceived teachers’ autonomy-supportive behavior, while the second presentation will apply the Eccles et al. expectancy-value model of achievement to explain boys’ underachievement in first language. The subsequent two presentations will then focus on a set of motivational variables under conditions of cultural diversity and analyze the role of social inequality and parental support with respect to motivational disparities between students with and without immigrant backgrounds. The symposium has the great advantage of jointly discussing empirical results from a variety of different countries. The findings of all four studies have important implications for educational systems and practitioners, e.g., when designing measures to increase school motivation and achievement in the context of diverse classrooms.

Autonomous Motivation of Students with Borderline Intellectual Functioning

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Rinat Sabag
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Israel

This study aimed to measure the autonomous motivation of students diagnosed with ‘borderline intellectual functioning’ (BIF) (IQ range 70-85), and to assess whether these students benefit from a
supportive educational environment as other students. Firstly, we assessed the validity of a projective measure for autonomous motivation for the use in students with BIF. Secondly, using a regression analysis, we examined the role of perceived teachers’ autonomy-supportive behavior in predicting the autonomous motivation of the students. Our results indicate that the level of motivation of students with BIF is validly measured by the projective assessment of motivation. The results also indicate that students with borderline intellectual abilities who study with supportive teachers manifest more autonomous type of motivation towards learning.

Applying the Eccles expectancy-value model of achievement to the underachievement of boys

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It is consistently reported that despite equal cognitive ability, girls outperform boys in school. These gender differences are especially pronounced in reading competencies and scholastic performance in first language. In contrast to girls’ historic underachievement in the MINT subjects, the reasons for boys’ worse performance in the above mentioned domains are not well understood. The present study applied the Eccles et al. expectancy-value model of achievement to explain boys’ underachievement in first language. The sample was recruited from three German schools preparing children for university (Gymnasium) and comprised 208 females and 213 males (mean age M = 16.43 years; SD = .55). According to the Eccles model gender, parents’ education, parents’ perceptions of their children’s abilities in first language, students’ average cognitive abilities and students’ previous grades in German predicted ability self-concept and values in German. These, in turn, predicted grades in German which served as achievement criteria. Even after considering the above mentioned variables gender still predicted performance in first language. The total effect of gender on performance in first language was .38. The indirect effect was .12. In contrast to explaining girls’ underachievement in math the investigated factors of the Eccles-model only partly contributed to explaining boys’ underachievement in first language. Other possible explanations for boys’ underachievement are discussed.

Differential Patterns of School Motivation in the Context of Migration:The Role of Social Inequality

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The purpose of the present study was the comparative empirical investigation of school motivation in students of culturally and linguistically diverse backgrounds. Potential disparities in the levels of adaptive as well as maladaptive dimensions of school motivation between students with and without immigrant backgrounds as well as the explanatory role of social inequality were investigated. Data from 785 students (50.9 % female; mean age M = 11.95 years; SD = 0.53) drawn from 36 different German schools tested in grade 6 (2010) were analysed. 22.2 % of the students had an immigrant background. School motivation was assessed with the 11 translated subscales of the Motivation and Engagement Scale (Martin, 2010). This highly differentiated and integrative measure does not only take into account adaptive cognitive and behavioural dimensions of school motivation, but also maladaptive cognitive and behavioural dimensions. Social background was operationalized by socioeconomic status, cultural possessions and social capital. The specified latent structural equation model showed a statistically significant positive effect of an immigrant background on the
maladaptive cognitive dimension as well as on the maladaptive behavioural dimension in grade 6. The inclusion of the social background variables in the model resulted in insignificance of the effect of immigrant background on the maladaptive behavioral dimension, while immigrant background remained a significant predictor of the maladaptive cognitive dimension. Implications of the results for research and pedagogical practice in the field of scholastic support for students with immigrant backgrounds are discussed.

**Differences in reading motivation between immigrant and native students: The role of parents**

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Christian Wandeler  
University of Freiburg  
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Alois Niggli  
University of teacher education  
Switzerland

Surprisingly, immigrant students usually report similar or even higher levels of interest and motivation compared to their native peers (Stanat & Christensen, 2006). Given the important role which parents play in fostering the academic motivation of their children, this article focuses on aspects of parental support and beliefs and analyzes their possible mediating effects on the student’s reading motivation. The structural equation models were specified with data of N = 891 Swiss fourth graders and their families. Findings confirmed for the present sample that immigrants had a significantly higher reading motivation than natives. Even though a mediation effect could be found for emotional support, differences in motivation between immigrants and natives could not be explained. The results highlight the parental role in fostering their child’s reading motivation. However, they indicate the need for future research to examine the potentially different mechanisms for fostering reading motivation in immigrant and native homes.

**Theoretical developments and empirical advances in higher education II: Teachers’ perspectives**

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Goethe-University Frankfurt  
Germany

Miriam Hansen  
Goethe-University Frankfurt  
Germany

Sabine Fabriz  
Goethe-University Frankfurt  
Germany

Jan Vermunt  
University of Cambridge  
United Kingdom

This symposium aims to bundle recent work on higher education from psychological as well as educational perspectives and to provide an opportunity for reflection and discussion on future
development in higher education research. It unifies contributions with diverse research methodologies and psychological concepts related to teachers in higher education: Ulrich provides an overview on existing models of good teaching in higher education and shows perspectives of improvement. Paeuler and Jucks as well as Mendzheritskaya and Hansen present quantitative studies with university teachers analyzing differences of epistemological beliefs among hard and soft disciplines (Paeuler & Jucks) and cultural differences between Germany and Russia regarding display rules of emotions in teacher-student interactions (Mendzheritskaya & Hansen). Gijbels and Peeters present a qualitative study with university teachers scrutinizing issues in their learning at the workplace.

Model of good teaching in higher education: relevant aspects and effect sizes

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This paper aims to investigate a model of good teaching in higher education. It integrates the results from all studies on good teaching found in an extensive literature review. Every single aspect of good teaching in the model (e.g. ‘motivation’) includes its average effect-size and the number of studies found. The effect-sizes will be reported for different academic outcomes: the student’s knowledge, competencies, satisfaction, scientific socialization etc. In a next step, the resulting model will be validated using the Delphi method. The Delphi study will include different experts for good teaching in higher education: (1) researchers in the field of learning sciences, (2) experienced university teachers who proved their teaching competence, and (3) trainer in instructional development programs.

Conceptions of teaching: On the impact of discipline and epistemological beliefs

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Regina Jucks  
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Germany

Reflecting one’s own conception of teaching is a central perspective on professionalization in university teaching. (1) How do conceptions of teaching diverge in so-called soft versus hard disciplines? (2) And how do epistemological beliefs relate to conceptions on teaching? Data from 72 university teachers and 309 students are reported in this presentation that provide an answer to these two research questions. Participants answered a survey including the Approaches to Teaching Inventory (ATI-R; Trigwell, Prosser & Ginns, 2005) and the Discipline-focused Epistemological Beliefs Questionnaire (DEBQ; Hofer, 2000) as well as demographic questions (for teachers e.g. teaching experience; for students e.g. number of semesters). An analysis of variance with the factors group (university teachers vs. students) and discipline (hard disciplines vs. soft disciplines) resulted in significant main effects for both factors on the Approaches to Teaching Inventory as well as on the epistemological beliefs questions. Participants from the soft disciplines were less teacher-focused and more student-focused and less naive in their epistemological beliefs than participants from the hard disciplines. Compared to students university teachers were less teacher-focused and more student-focused and also less naive in their epistemological beliefs. There was no interaction effect between the two factors. Correlation analysis on the relation between conceptions of teaching and epistemological beliefs revealed a positive relationship between teacher focus and naive epistemological beliefs. Results will be discussed with regard to practical implications for
teaching in higher education and theoretical aspects regarding the dimensions of the used inventories.

**Shall I show my anger? Display rules in lecturer-student interaction in Germany and Russia**

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Germany

Miriam Hansen  
Goethe-University Frankfurt  
Germany

We conducted an online-study with lecturers at universities in Germany (N = 54) and Russia (N = 48). Our participants completed a modified version of the Display Rule Assessment Inventory (Matsumoto et al., 2008) and judged the appropriate expression mode for seven emotions towards students. We varied the student’s gender as well as the type of situation (lecture vs. consultation hour). In line with our expectations, results displayed significant effects of culture, student’s gender, and the type of situation: Lecturers in Russia tend to show less negative emotions. Lecturers in both countries mask their emotions more towards male students and express their emotions more in consultation hours compared to lectures. We will discuss the results in the context of cultural communication and communication at universities.

**Understanding learning at the workplace: The case of teachers-in-training in Flanders**

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Lore Peeters Lore  
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Belgium

The focus of the present paper is on the learning in the workplace of teachers combining a teaching job with an in service-teacher-training program at the university. The central research question was which work-related and training-program related factors facilitated the learning at the workplace of these teachers. Based on the framework of the Job-Demands-Support-Control model a total of 11 teachers were interviewed. Results of the qualitative analyses indicated that a high level of job demands, a high level of autonomy and a high level of social support were important issues in the learning on the workplace of these teachers. Social support and guidance from colleagues at the workplace seemed more relevant for learning than the support and guidance form the supervisors from the teaching program at the university. Implications for practice and for further research are discussed.

**Studying Practice and Developing Practice-Based Studies**

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Ball and Forzani (2007) argue that as long as education research is dominated by studies that focus on factors remote from instruction it will provide limited help for understanding and improving practice. Interestingly, this challenge exists even for research on teachers and teaching. The seeming contradiction that Goldhaber and Anthony (2007, p. 135) point out, ‘between the fact that teachers have a large impact on student achievement, but specific teacher attributes are not consistently found to directly impact student achievement,’ testifies to Ball and Forzani’s claim. This session explores what it might mean to engage deliberately in what we call practice-based study of teachers and teaching. The first presentation examines the differential effects of teacher enthusiasm on student outcomes and uses classroom observations and student ratings to hypothesize about aspects of the work for which enthusiasm might be important. The second uses analyses of classroom instruction as a basis for understanding the nature and role of knowledge of the mathematical horizon for teaching. The third examines teacher reasoning and the roll it plays in shaping students’ opportunities to learn sensemaking in elementary science instruction. The last presentation provides a theoretical argument for developing practice-based approaches to the study of teachers and teaching and will use the presentations to provide examples of strategies for developing such approaches. The discussant, Sean Delaney, will summarize specific ways these presentations contribute to understanding how teachers and teaching matter in practice and how the notion of practice-based study might inform future research.

**Teacher enthusiasm, quality of instruction and student outcomes in primary and secondary science**

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The paper investigates teacher enthusiasm in primary and secondary science and how it relates to student outcome and instructional behaviour. As the task of teaching has a twofold nature, teacher enthusiasm for science subject matter has to be distinguished from enthusiasm for teaching science. The aim of this study is to investigate whether differences in teacher enthusiasm exist among primary and secondary teachers and to determine whether the two dimensions are equally important for effective instruction and student outcome gains at different school levels and tracks. A total of 114 teachers (60 primary and 54 secondary) and their fourth- and sixth-grade students participated in the study. Questionnaires were used to assess teachers’ enthusiasm, student outcomes and instructional practice. Analysis of variance revealed significant differences between teachers with academic track teachers more enthusiastic about science. Furthermore, multilevel models revealed differences concerning the impact of teachers’ enthusiasm on student achievement:
Enthusiasm for teaching was a significant predictor for student achievement gains in secondary, but not in primary schools. In contrast, teachers’ enthusiasm for the subject matter was a significant predictor for students’ subject-related interest at the primary level. Examining correlations between the two dimensions of teachers’ enthusiasm and different aspects of instructional practice, different correlational patterns emerged. Thus, it seems reasonable to hypothesize that teacher enthusiasm impacts teaching and learning differently in different grades. Implications for selecting teacher candidates and the design of teacher education and professional development programs will be highlighted.

Using a Practice-Based Approach to Understand Horizon Content Knowledge

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During the last decade several attempts have been made to understand the knowledge needed for the work of teaching and several theoretical frameworks have been proposed to this end. In our work, we draw on the Mathematical Knowledge for Teaching (MKT) framework to understand what is entailed in teaching. Perhaps one of the least understood domains of this framework has been horizon content knowledge (HCK), the knowledge that enables teachers to see how the content being taught is situated in and connected to the broader disciplinary territory. In this paper, we follow a practice-based approach aiming to understand the nature and role of HCK in informing instruction. We do so in two ways: first, we analyze instructional episodes and interviews with teachers/teacher educators from our respective countries, to identify, describe, and unpack situations in which HCK is implicated during teaching mathematics. We then employ these episodes to design simulated vignettes, which we use in interviews with prospective and practicing teachers to better understand the nature of teacher reasoning about HCK in practice and the potential of simulated vignettes to support teacher learning of HCK. Our analysis of such data suggests that teachers find that HCK provides useful orientation to hearing and working with students; the teachers also found the simulated vignettes to offer a good venue for thinking about and discussing HCK, which they thought as being intertwined with other MKT domains. We consider the implications of these findings for teacher education/training and curriculum development.

Teachers’ Reasoning about Students’ Sensemaking in Elementary Science Learning Environments

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Students’ sensemaking about natural phenomena is the fundamental objective of reform-based science teaching and learning. Contemporary research has shown that, when provided appropriate scaffolding, early learners (elementary or primary students) can engage effectively in scientific sensemaking. However, little research has been conducted to explore elementary teachers’ instructional practices for science, both planned and enacted. In this mixed-methods study, we use observation- and artifact-based data, as well as in-depth interviews, to investigate the pedagogical reasoning underlying inservice elementary teachers’ planning with and enactment of elementary science curriculum materials. Study findings provide evidence for the relative deemphasis on sensemaking practices in the teachers’ planned and enacted science instruction, as well as patterns in their pedagogical reasoning that help explain observed instructional practices. Study findings have important implications for the design of practice-based preservice teacher education and inservice professional development programs, as well as teacher-educative science curriculum materials, which can serve to scaffold teachers’ learning and practice.

Developing Practice-Based Approaches to Study Teacher Attributes

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Scholars have debated which teacher attribute is primary in determining teachers’ practice. Some claim identity is at the core of teachers’ ways of being and acting; others argue teachers’ actions depend principally on their knowledge or beliefs. We argue, whichever attribute is examined, it is important to study how that attribute is used in the work of teaching and how its use shapes core instructional interactions critical to learning. We claim that this can be done by developing research questions that provide insight into how an attribute shapes instruction and research designs appropriate to the study of such questions what we call practice-based approaches. To illustrate and support our argument, in the presentation we will provide a definition and use it to describe ways in which other studies presented are and are not practice-based, and ways in which they could be extended to be. We will unpack ways in which each study’s practice-based elements distinctively contribute to understanding and potentially improving practice. We will end with observations about the nature and contribution of practice-based approaches in the field more broadly and characterize ways in which the development and use of practice-based approaches would create greater coherence across research efforts as it increase the relevance of research to innovation and improvement.

The interplay between scaffolding and motivation in teacher-student interactions

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In educational settings, teacher-student interactions are regularly studied from the perspective of scaffolding. Although research on scaffolding has focused mainly on the scaffolding of skills, the student’s motivation can also be scaffolded through teacher-student interactions. The aim of this symposium is to present new ways of studying the intrinsic links between scaffolding and motivation, and to discuss the important outcomes that these studies have for educational practice. All four papers take teacher-student interactions as their primary unit of analysis, thereby a) exploring new methods of studying how these interactions unfold over time, and b) offering concrete suggestions to help teachers scaffold their students’ skills and motivation. The first paper demonstrates how teacher-student interactions change in the course of a reading comprehension intervention aimed at strategic and motivational scaffolding. Despite the overall positive effect of the intervention, teachers still had difficulties providing a dynamic match to the students’ level. The second paper shows that an intervention with middle school teachers that was focused on fostering students’ psychological needs not only helped teachers to better support their students’ motivation, but also to apply more contingent scaffolding. The third paper is focused on the emergence of problematic learning trajectories in special education, and shows the added value of a process approach to help identify the underlying mechanisms of changing student engagement over time. And finally, the fourth paper demonstrates how autonomy (an important prerequisite of intrinsic motivation) and scaffolding develop within the same teacher-student dyad over longer periods of time, in the context of individual music lessons.

**Dynamic systems analysis of teachers’ multimodal scaffolding and students’ participation**

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This paper shows how teachers scaffold students during a reading comprehension intervention. We display real-time dynamic instructional match and the provided opportunities between the teacher’s strategic and motivational scaffolding and the students’ practicing with the state space grids (SSGs). Experienced teachers (n = 11) participated in a half-year-long intervention to foster students’ reading comprehension. Low-achieving students (n = 57) were selected from the sample of 437 ten-year-old students on the basis of the pre-test scores in reading comprehension and motivational vulnerability. This paper illustrates an in-depth analysis of the scaffolding patterns of two teachers and the participation of their six students. Codes describing the levels of strategic-motivational interaction were given for each participant’s turn and plotted on strategic-motivational SSGs to describe the scaffolding and the student participation during the intervention. Pre-, post-, and follow-up tests indicate significant intervention effects on students’ reading comprehension. However, interaction analyses show that it was challenging for the teachers to find a dynamic match and provide
opportunities for sustainable learning regardless of the guidance provided to them. A clear attractor was pre-strategic interaction, where students’ skills may become consolidated, but further progress is slow. The preliminary results of motivational analysis show that the teachers also had difficulties in motivationally supporting high level learning. The significance of the study lies in developing advanced methods for dynamically and developmentally analyzing multimodal instructional interactions. Findings on scaffolding challenges have important implications to studies applying educational theory to attain fundamental and sustainable changes in educational practice.

Do changes in motivationally supportive instructional strategies lead to an increase in scaffolding?

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We conducted a 3 year intervention with all the teachers at one middle school. Teachers learned about 4 principles of motivation (supporting students’ competence, autonomy, belongingness, and making content meaningful) and instructional strategies that were consistent with these principles. Eight randomly selected teachers were observed 4 times a year for 3 years. Teacher instruction was coded from 0 (low) to 3 (high) on providing opportunities for competence, autonomy, belongingness and meaningful learning. Observers also coded instances of scaffolding on a frequency scale of 0 (absent) to 3 (observed 5 or more times). Half the observed teachers increased their use of motivational strategies significantly from year 1 to year 2 and maintained them in year 3. Instances of scaffolding in these teachers’ classes also increased significantly from year 1 to year 2. The other half of the observed teachers maintained a low level of motivational support throughout the 3 year intervention with scaffolding also low. This suggests that a theoretically-based professional development project can help teachers use more effective instructional practices that result in a valuable outcome, increased support for learning. It also shows that teachers can change instruction and maintain new practices. Implications are that teachers can and do change pedagogical strategies if they are doable and if they understand the rationale. Nevertheless, as results for teachers who did not change practices demonstrate, this is a challenging endeavor for researchers and teachers alike.

Scaffolding and Task Behavior; Their Role in the Emergence of Problematic Learning Trajectories

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Currently, most researchers agree that learning is a socially situated, transactional process, in which both the teacher and the learner make their own unique contribution. But how does one get insight into such a complex process, and what are its central properties? The aim of this study is to examine problematic learning trajectories of special needs children, i.e. those with psychiatric and behavioral
problems. This is done by a micro genetic study of individual scaffolding sessions during arithmetic, and the level of activity of the student during such scaffolding sessions. In addition, the students’ patterns of task behavior are examined as an indicator of their achievement motivation. Longitudinal data of four special needs students in a special school for children with emotional behavioral disorders were collected, by making videotapes of math lessons in two-weekly intervals over a two-year period. Interaction variables were the teacher-student ‘response matches’, and the teacher’s ‘feedback responses’. Students’ task behavior was examined focusing on their amount of ‘on-task’, ‘off-task’, and ‘help-behaviors’. First empirical results point to few verbal actions initiated by the students in interaction with the teacher. With regard to the scaffolding dynamics and students’ task behavior, intra-individual and inter-individual variability occurs over all lessons in all students. In the presentation, we will go into the surplus value of using a case study approach, i.e., in examining ‘response matches’ per individual student-teacher dyad and student’s patterns in task behavior, and how they are linked to long term developmental trajectories of students’ learning processes.

**Autonomy and scaffolding in teacher-student interactions in the context of individual music lessons**

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Learning to play a musical instrument builds on a complex set of skills, which require high self-regulation and motivation. This makes individual music lessons a highly relevant context for studying scaffolding and motivation. In this study, we aimed to measure how autonomy development and scaffolding unfold from moment to moment in teacher-student transactions, and link these micro-interactions to long-term development. Four teacher-student dyads of beginning violin and cello students were followed for 18 months (28 repeated measurements) by means of video-observation and teacher interviews. The videos were coded on a) scaffolding contingency (match between teacher and student level) and b) levels of student autonomy and teacher autonomy support. The four dyads showed great differences between their micro-level interactional patterns, as well as over longer periods of time. Overall, the amount of out-of-synch in autonomy levels declined over time, indicating that teacher and student became more adapted to one another. This new way of studying scaffolding and autonomy development (connecting real-time change in dyadic interaction to long-term development) adds to our understanding of the underlying mechanisms. Moreover, this benefits educational practice by giving (music) teachers insight on how to maximize their contingency through both scaffolding and autonomy support.

**Assessment of Learning Progress**

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The assessment of learning progress in education supports teachers in keeping track of students’ performance development in class, enabling educators to adjust their teaching to individual needs. Curriculum-Based Measurement (CBM) is an established approach to assess learning progress by applying parallel forms of tests throughout the school year. A prerequisite for the assessment of learning progress is the availability of short and technically adequate assessment tools. This symposium discusses new findings on the assessment of learning progress in mathematics and reading. The first presentation deals with the assessment of learning progress in mathematics. The study analyses the predictive value of computer-based CBM tests as well as the additional contribution of information about slope. The following presentations address the assessment of learning progress in reading. In reading, assessment of learning progress is often realized using a maze task. While previous research supports the technical adequacy of this measure for young children, the second presentation analyses if the maze task can also be used as a general index of reading proficiency at the secondary school level. The third presentation deals with the relative contribution of different component skills in predicting performance in the maze task and discusses implications of these findings for the instructional decision-making process. Finally, the last contribution presents findings on a newly developed test concept that supplements the maze task by questions to assess higher processes of reading comprehension following hierarchical models of text comprehension. Overall, the symposium will present applied research on learning progress assessment in regular education.

Predicting maths performance in primary school: Results of a computer-based progress monitoring tool

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Progress monitoring tools (as in Curriculum-Based Measurement, CBM) repeatedly showed high levels of concurrent validity in former studies. However, little is known about their longer-term predictive value. Aim of the study was to assess the predictive validity of internet-based progress monitoring tests in mathematics. Nine second-grade classrooms (n = 174 children) took part in the
study, participating in computer-based progress monitoring tests and three standardised paper-pencil tests (DEMAT) throughout grade 2 and grade 3. At the beginning of grade 2, a first paper-pencil test was administered. Throughout the school year, eight short CBM online tests were self-conducted by the students on the computer, assessing different mathematical competencies and their development over time. A 2nd paper-pencil test was conducted at the end of second grade and a 3rd test at the end of third grade. Findings indicate that the short online tests are predictive of the performance at the end of third grade (.35

**CBM progress monitoring in reading for secondary-school students: The technical adequacy of the maze**

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Students with learning disabilities often experience difficulties in reading. This does not only occur at the elementary-school level, but also at the secondary-school level. Teachers are faced with challenges to address the special needs of these students. They could benefit from a tool that reliably and validly measures the effects of instructions on student learning. One such tool is Curriculum-Based Measurement (CBM). With CBM, teachers can collect data on students’ performance in an academic area on a frequent (e.g. weekly) basis and create graphs representing student progress. Based on the data, instructional decisions can be made to improve students’ achievement. A large body of research has supported the technical adequacy of CBM progress measures, and demonstrates that when teachers use CBM, students’ performance improves. These studies have mainly been focusing on the elementary-school level. This study extends the research on the technical adequacy of CBM progress monitoring in reading at the secondary-school level. Participants were 7th to 11th grade secondary-school students. Over a period of four months students’ reading performance were measured weekly with 12 parallel forms of the maze task. Mazes were passages where every 7th word was deleted and replaced by multiple-choice items. Students read silently through the passages and circled the correct answers for two minutes. Criterion variables consisted of scores on standardized reading achievement tests, and course grades. Analyses are underway and will examine the reliability, sensitivity, and validity of the maze task for assessing students’ reading growth.

**The CBM-Maze test: A Closer Look at What it Measures**

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The CBM-Maze test was designed to be a general index of reading proficiency, and is often used as a test of reading comprehension. Given the multidimensionality of reading comprehension as a construct, it is important to explore the relative contribution of different component skills to the CBM-Maze test. Knowing on which component skills a child’s performance on this test depends is important for the use of CBM-Maze for instructional decision-making. In the present study, we address this issue by investigating the relative contribution of cognitive, phonological, rapid automatized naming (RAN), orthographic, and word reading fluency measures to CBM-Maze. This investigation was carried out longitudinally, from Grade 1 to Grade 2, in a typical Greek-Cypriot speaking children population. Analysis using Structural Equation Modeling showed that reading performance as measured by the CBM-Maze test was significantly predicted by two component skills: word reading fluency and RAN. Cognitive, phonological, and orthographic processing skills did not significantly predict reading performance in this model. Implications of these findings are discussed with respect to the use of CBM-Maze as an instructional decision-making tool.

Assessment of reading progress in fourth grade: Differentiating between fluency and comprehension

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Providing teachers with diagnostic information about their students’ reading progress has positive effects on learning outcomes if teachers use the diagnostic information to adapt instruction to individual needs. The aim of this study was to examine the technical adequacy of a newly developed computer-based assessment instrument for monitoring student reading progress following the Curriculum-Based Measurement (CBM) approach. In contrast to the commonly used reading aloud or maze task, this instrument is based on hierarchical models of text comprehension and assesses both basal reading skills (reading rate and reading accuracy) as well as higher processes of reading comprehension. A total of eight parallel CBM tests were developed. Over a period of six months, 508 fourth-grade students completed these tests at intervals of three weeks. At the beginning and at the end of the study, students also finished two group-administered standardized reading tests to examine the construct validity of the CBM tests. Results indicate that the eight CBM tests show satisfactory reliability (.86 Overall, computer-based assessment of students’ reading progress has proven to be applicable in general education. Initial analyses show a good psychometric quality of the short - and at the same time differentiated - CBM tests.

Students’ navigation strategies and text comprehension in hypertext
With the rise of the internet, reading and learning with hypertext has become a common task both in formal and informal learning contexts. The inclusion of hyperlinks is likely to change the way how people read and process information. On the one hand, hyperlinks can provide the reader with additional information that may help to understand the main text. Furthermore, hypertext might support deeper information processing, as the reader has to actively decide which information to select in which order, based on what is needed to achieve the learning goal. Third, structural features of hypertext, such as navigable graphical overviews, can function as scaffolding. On the other hand, navigation decisions on whether to follow a link or not might require additional cognitive resources, because readers have to constantly monitor the adequacy of their reading path. Incorrect selections of links, such as clicking on a distracting page irrelevant for the learning goal, would lead the reader to irrelevant documents, and may increase the difficulty of putting all information pieces together in a coherent mental representation. The presentations in this symposium aim at identifying effective reading and link selection strategies that foster students’ text comprehension in different hypertext interfaces (e.g., a tag cloud interface, concept-map interface, encyclopedic hypertext, search engine interface). Furthermore, relationships between individual variables such as reading skills (Amadieu et al.), working memory capacity (Kammerer et al.), grade level (Salmerón et al.), and gender (Walhout et al.) and link selection strategies and text comprehension are addressed.

Effects of link selection and working memory capacity on text comprehension in encyclopedic texts

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Based on a claim made by Carr (2010) the present study examined whether the inclusion of hyperlinks in an encyclopedic text (i.e., a hypertext) impaired readers’ text comprehension as compared to an equivalent version with bold words instead of hyperlinks. Furthermore, the moderating role of working memory capacity (WMC, measured with a reading-span test) on link selection and text comprehension was investigated. Participants’ task was to read two texts about historical events, one presented as hypertext and one presented as non-hypertext, and to answer a set of inference-questions after having read each text. To keep the amount of information equal in the hypertext and the non-hypertext and to exclusively investigate the influence of the presence of links and the process of selecting links, but not of navigating to the linked pages, in the experiment clicking on links did not immediately open additional pages. Contrary to Carr’s claim results of the study revealed no differences in participants’ text comprehension between the two text formats, indicating that the inclusion of hyperlinks does not impair text comprehension. Individuals’ WMC positively influenced their text comprehension. In the hypertext, however, the effect of WMC on text comprehension decreased with an increasing number of links selected; i.e., when selecting many links participants with low WMC achieved as well as participants with high WMC. This finding supports the theoretical notion that hyperlinks can help to focus on the task and can promote a deeper information processing, because readers have to actively decide which links to select.

**Do boys differ from girls in navigating through hypertext environments when learning?**

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Since hypertext learning environments (HLE) are widely used in education, it is important to study the effects and consequences of its use. Earlier research suggests that learning outcomes based on hypertext environments depend on learner characteristics in conjunction with hypertext specific features. Since the variety in interfaces is enormous, students are challenged to develop new methods of navigating for each HLE. It is therefore important to develop interfaces that facilitate
learning as much as possible. In this paper a user characteristic (gender) and a hypertext feature (navigational support) are studied. Navigational support was varied by using either a novel tag-cloud format as navigation structure or a conventional hierarchical menu. The results show that there is no difference in gender or navigational support regarding task performance. However, there are differences in the way participants looked at the navigation structure. Participants which used a tag cloud for navigation, looked considerably longer at the navigation structure than participants using a hierarchical menu. The longer fixation times might be due to participants’ unfamiliarity with using a tag cloud interface. Because there was no difference in time on task and no differences in task performance, however, it can be concluded that using tags as navigational support does not hamper performance as compared to more traditional navigation structures.

Learning from hypertext with a concept map: individual differences, online processes and performance

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Concept maps are considered as tools supporting navigation and learning in hypertexts. A study was carried out on the relations between comprehension performance (text base and situation model), online processes (navigation, map processing) and individual differences (prior knowledge, personal interest, reading skills, reported internet reading strategies). 80 10th grade students were instructed to read a hypertext using an interactive concept map (i.e. clicking on a concept opened a short text about the concept). The concept map represented the main concepts involved in the greenhouse effect and their relationships. The results did not show any significant relation between the learning performance and the reading path coherence. However, results indicated that longer reading times of the texts favored comprehension at a text base level, whereas studying the map at the beginning and at the end of the learning task facilitated the situation model construction. Concerning the influence of individual variables, reading skills and non-linear on-line reading strategies supported text-base scores by a higher number of concept openings. For the situation modal, personal interest, reading skills, and non-linear on-line reading strategies improved the scores through longer processing of the map at the beginning as well as at the end of the learning task. Prior knowledge did not seem to play a specific role. Overall, the results concur to previous studies indicating that
learning with an interactive concept map is effective when learners have specific characteristics that help them to adopt strategic navigational behaviors during learning.

How hypertext navigation skills develop across secondary school

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Nowadays, to be successful students, children must develop the necessary skills to be fluent Internet readers. However, currently little is known about children’s navigation skills and about how they progress across secondary school. To fill in this gap we explored the extent to which students from 7th to 10th grade used superficial or semantic cues to navigate across different scenarios. Data from 580 students reveal the existence of a progression from using superficial to semantic cues from 7th to 10th grade, which is linked to students’ improvement in comprehension skills.

Learners are doing it all by themselves?! – The role of generative activities during learning

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The ability to self-regulate one’s own learning is seen as a crucial aspect regarding the successful acquisition of knowledge and transfer skills. Consequently, a vast amount of research has dealt with the question, how such abilities can be supported. This symposium focuses on the role of generative activities and aims to shed light on the question, how such activities can be fostered in learners on the one hand, and how they can be used to induce successful learning on the other hand. One possibility to do so is to ask learners to visualize important aspects of what they just learn by means of drawing. In this regard, the first two papers focus on the effectiveness of self-generated drawing during learning, and in particular on the questions, whether the cognitive processes underlying this generative activity can be assessed by means of think-aloud protocols (Paper 1) and whether self-generated drawing can also be used within computer-based learning settings (Paper 2). Another option, which is focused on in Paper 3 is to induce generative activities by asking learners to create
learning materials for others, that is, by letting them change their perspective during learning. Finally, Paper 4 introduces a multi-agent intelligent tutoring system that can be used to enhance generative activities during learning by providing learners with some kind of guidance and feedback during their self-controlled learning with a (computer-based) hypermedia system. Results show that all of the approaches introduced here seem to be suitable to foster generative activities and thus self-regulated learning.

**Cognitive Model of Drawing Construction: Using think alouds to measure cognitive processes**

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The Cognitive Model of Drawing Construction (CMDC; Van Meter & Firetto, in press), a revision of the Generative Theory of Drawing Construction (GTDC; Van Meter & Garner, 2005), is a theoretical model describing the cognitive processes of drawing construction. This revised model incorporates components from Winne and Hadwin’s (1998) self-regulation model and Schnotz’s (2005) Integrated Text and Picture Comprehension Model. The CMDC emphasizes learner-generated drawing as a learning strategy. One hypothesis set forth by the CMDC is the prediction that drawing is a generative activity, in part because it stimulates the use of other learning strategies. This paper describes a study in which 15 college thermodynamics students thought aloud while working through an experimental homework assignment. All participants watched video tutorials explaining problem concepts and teaching participants how to reason through thermodynamics problems by drawing plots. After watching the videos, all participants completed a three-problem exercise that was designed to stimulate use of taught problem solving processes. On this exercise, half of the participants spontaneously drew to support problem solving and half did not. Participants who drew had higher delayed posttest scores than students who did not draw on an external measure of thermodynamics reasoning. We are currently coding the contents of all participants’ think alouds to capture the generative learning strategies participants used while solving these problems. We hypothesize that episodes in which drawing is used will be marked by an increased frequency in the use of cognitive and metacognitive strategies such as self-questioning, self-explaining, and monitoring.

**Computer-Supported Drawing as a Generative Activity in Learning from Scientific Text**

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This study investigated whether the generative drawing principle (i.e., asking learners to create drawings of scientific text) applies to computer-based learning environments. Computer-based lessons in chemistry and biology were presented to 246 8th-graders along with corresponding illustrations, instructions to create illustrations using computer-based tools, both, or neither. Results indicated that students who were required to draw computer-based illustrations performed better on drawing tests (in chemistry and biology lessons) and transfer tests (in chemistry lessons), and on retention tests (in chemistry and biology lessons) when difficulty rating was used as a covariate. These results show that the generation of visualizations within a computer-based setting during learning can foster students’ generative processing leading to text comprehension, when the students receive enough drawing support to minimize extraneous processing.

Design tasks as generative activities: The role of perspective-taking and quality of source material

According to the generative learning model (Wittrock, 1989), learning can be understood as a process in which learners actively construct meaning. The instructional approach Learners as Designers (LaD, Jonassen & Reeves, 1996) embraces the idea of generative learning. In this approach learners are encouraged to design and produce learning materials for other learners. Thus, they have to construct texts as well as illustrations and other representations for their digital media while becoming knowledgeable in a particular topic. In the present study it was investigated, if perspective-taking and the quality of source materials had an impact on learning outcomes. In a two-by-two design participants had to design either a learning environment for others or a knowledge representation for themselves before their gained knowledge was assessed. Preliminary results indicate that performing perspective-taking can be a powerful source of fostering knowledge acquisition, especially, if a knowledge domain is unstructured.

Metacognitive Processes Underlying Generative Activities during Learning with Multi-Agent Systems
Data on 90 college students who were randomly assigned to one of three experimental conditions and used MetaTutor (a multi-agent intelligent tutoring system) to learn about the human circulatory system for one hour. During the learning session, we collected product (e.g., pretest, posttest, quiz scores, summaries of the topic) and process (e.g., concurrent think-alouds, eye-tracking, and notes and drawings) data to analyze the roles of cognitive and metacognitive processes during learning about the topic with the multi-agent system. Process data was analyzed, using several interdisciplinary methods, to examine the roles of cognitive and metacognitive processes related to students’ generative activities and their performance. The results focus on quantitative and qualitative issues related to the mediating effects of self-regulatory and generative activities in facilitating students’ construction of complex and advanced mental models of the biological system. These analyses are key to designing an agent-system that can effectively and adaptively foster generative activities during complex learning.

Reflective Writing Assignments for Fostering Retention, Transfer, and Future Learning

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Typically, the contents of lessons ‘evaporate’ rather quickly. After learners have left the classroom, few continue to organize or elaborate the materials to which they were just exposed. As a consequence, learners typically show poor long-term retention and restricted understanding, which hinders transfer and future learning. Furthermore, illusions of understanding are likely to occur. A method that helps to overcome these problems is journals writing as follow-up activity (e.g., after lessons). The learners are supposed to reflect on what they have just experienced by applying cognitive and metacognitive strategies while writing journal entries. Again, however, many learners do not spontaneously engage in such strategies. In laboratory and field studies, we analyzed the effects of support procedures optimizing the method of journal writing. We found that prompts for cognitive learning strategies (i.e., cognitive prompts) foster strategy application as well as retention and understanding (transfer), in particular if the prompts are adapted to the learner’s initial strategy deficits. In the long run, when learners have begun to acquire strategic skills, cognitive prompts lose their effectiveness and get even detrimental (‘over-assistance effect’). Adaptively fading prompts over time is a solution to this problem. Metacognitive prompts are only helpful when context conditions support attempts to close knowledge gaps. Learning to apply journal writing in new domains (i.e., future learning) can be successfully fostered by examples of good ‘journal entries’ and by informing the learners about the functions of prompts. The findings of this research program are in line with a self-regulation view of writing-to-learn.

Joint responsibility and the advancement of teacher learning in mentoring and classroom-based coaching

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Teaching is a complex and demanding design profession, which cannot be learned from lectures and literature alone. Classroom-based training assisted by mentor teachers is pivotal in teacher education, and student teachers believe such learning experiences to advance their teaching skills. Nonetheless, little is known about the effects of different practices of mentoring and coaching on student teacher learning. Teacher educators’ and mentor teachers strongly focus on assisting student teachers to reflect on lessons and on providing feedback and suggestions. When understanding teaching as a design profession, the emphasis on post-action reflection is not conducive to realistic deliberation and co-construction of lesson design. During joint planning, student teachers and mentors are mutually responsible for the lessons, with the shared goal of fostering pupils’ learning in the classroom. From a socio-constructivist view, joint planning in pre-lesson conferences provides opportunities for student teachers to carefully think through and plan lesson designs while being able to draw on mentor teachers’ expertise. Based on a review of the literature and our own quasi-experimental intervention studies, I will address features of mentor teachers’ assistance that have been shown to have an impact on student teacher learning. In particular I will focus on the kinds of joint responsibility implied in different approaches to mentoring and coaching student teachers and on how these encourage and constrain teacher learning. It will be argued that for the design of practice-based teacher training the deliberate use of joint responsibility can be a powerful strategy to advance teacher learning.

‘Instructional disobedience”: Challenging instructional design research

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Instructional design as a research field aims at identifying sustainable principles that can be used to design and develop learning environments. The basic rationale is the following. In order for learners to reach (instructional / learning) goals, learners have to engage in particular learning activities. Due to a wide variety of reasons reaching instructional goals is not always easy for learners. In order to help them, learning tasks are deliberately selected or constructed and well-sequenced. Moreover, additional support is provided. The nature of that support depends on the problems learners may experience and on the setting in which that support is to be delivered. Ample research has been done on that support. In text-based environments adjunct aids such as pre-and post-questions, objects and keywords were studied. In digital environments different kinds of tools or support devices were investigated: prompts, graphical organizers, pedagogical agents. The effects of support on cognitive, metacognitive as well as motivational aspects of learning processes in text- as well as computer-based learning environments is a common research interest.

Responsible Career Management and Sustainable Employability

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Ageing and dejuvenization of the working population urge us to pay directed attention to sustainable employability policy as being part of Strategic HRM. In this keynote address, a positive psychological approach is used to deal with the possibilities both employees and working organizations have to stimulate employees to develop healthy, prosperous, challenging, and productive careers until retirement age or even after that. Only when we have a better understanding of career influences will we be able to provide structured career support that takes into account both individual, organizational, and labor market circumstances.
Developing an assessment for learning culture. A question of sustainability

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The research topic is assessment for learning, a topic central to educational discussions in Norway as well as in the other European countries. There is solid research evidence that teachers’ high competence and skills in formative assessment and assessment for learning enhances student learning. Recent Norwegian research has shown that long term projects are necessary in order to develop an AFL culture in school. However, little is known about how to sustain the formative assessment practice in schools which have succeeded in developing an AFL culture. The current paper examines the sustainability three years after a 2 years intensive AFL project in a Norwegian primary school. An AFL culture is about developing a learning dialogue between all partners in school, leaders, teachers and student, based on information collected from assessment activities. Thus the theoretical foundation is a socio-cultural perspective to learning and development. The current study is a phenomenological oriented case study of one primary school. Data is collected by interviewing the school principal and 3 focus group interviews with different groups of teachers.. Both the principal and the teachers claim that assessment practice in the school involves the students to a larger extent than prior to the R&D process five years ago. A second finding is that the school and the teachers have developed their own assessment practice informed by the knowledge acquired through the project. They claim that the reason for this is the long term and deep collective learning that took place during the R&D process.

Investigating the attitudes of adolescent EFL learners towards peer assessment of writing

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The use of peer assessment (PA) as an alternative form of evaluation method is reported to be helpful in learning and is increasingly being adopted in secondary education settings (Wen and Tsai, 2006). The current study employed a 16-item Likert-scale instrument to evaluate participants’ attitudes towards PA of writing. A sample of 60 Cypriot adolescent EFL students participated in the study. These students received teacher feedback and either provided or received peer feedback. The findings indicated that students had a positive attitude towards PA. The responses collated in this study have provided a useful insight into student attitudes to PA in order to design better PA processes. The results both support and extend previous research and give a more detailed picture than previously available. Taking into account the centrality of the student’s role in the implementation of PA initiatives, the aim of the present study was to take into account the voice of students, which is consistently ignored in education reform, in order to facilitate educational change (Cook-Sather, 2002).

Improving Primary Students’ Mathematical Achievement with Technology-Enhanced Formative Assessment

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Questions for Learning (QfL) allows pupils to answer questions on wireless electronic handsets at their own pace and provides instantaneous feedback to the pupils and their teachers about the pupils’ understanding of the concepts just taught. A randomised quasi-experiment evaluated the use of QfL to determine if this form of technology-supported formative assessment increases pupil learning. Seven primary schools in the North of England were randomly assigned to experimental (4 schools) or control (3 schools) conditions for a 12-week trial period during the Spring and Summer terms, 2011. Each of the schools had one Year 5 class, except one control school, which had 2, making 4 classes for each condition. There were 221 pupils in total, 109 in the experimental condition and 112 the control condition. Learning Clip, a mathematics programme delivered on the interactive whiteboard, provided the mathematical content for the lessons for participating classes in both the experimental and control groups. The only factor differentiating the experimental and control groups was the use of QfL. Equivalent pre- and post-tests reflecting the Year 5 lesson content in both conditions were the measures used. Training in Learning Clip and QfL was presented by Learning Clip personnel to teachers and reinforced by ongoing support. Results showed no statistically significant difference between pupils’ scores at pre-test and a statistically significant difference in their post-test scores, favouring the experimental group (effect size = +0.39). This relatively small evaluation indicates a great potential for technology-supported formative assessment in increasing primary children’s mathematics achievement.

Decision Making in Multiple-Choice Items: Predicting Option Preference and Choice from Eye-Fixations

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Even though multiple-choice (MC) items are the most common assessment format, to date almost no knowledge exists concerning the cognitive processes elicited from students using items of this type. Growing interest in cognitive processes in the context of assessment calls for a new approach in the mostly psychometric dominated research area, e.g. by using eyetracking technology to gain insights into the process of item-solving. To groundwork this future research, the current eyetracking study closes a gap of fundamental research by investigating the relationship between the preference for an answer-option in MC-items and the corresponding fixation-time on that answer. Regarding the test-topic ‘The Brain’, groups of expert and lay students answered 21 MC-items on a computer while their eye-movements were being recorded by an eyetracker. Subsequently, participants rated every answer-option according to three categories of subjective preference. Results indicate a strong and linear relationship between preference for an answer-option and total fixation-time on that option. This gaze bias effect shows up independent of the test-content knowledge, while lay students generally tend to fixate answer-options for longer duration and, therefore, the effect occurs at a different level for the two expertise groups. Beyond that, a process-tracking analysis over time allows
for an observation of eye-movement-patterns related to option preference and item-solving behavior. This analysis reveals differences and similarities between the expertise groups. In summary, the study allows for new insights into the decision-making behavior of students when working with MC-items. Moreover, it provides a valuable basis for future research in the MC-field.

Measuring democratic competence as an overarching theme of learning in schools

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Democratic competence may be viewed as a set of dimensions fostering that people comprehend and value the democratic system and continuously participate in it: - Civic knowledge about the democratic system. - Willingness to be informed about politics. - Positive attitudes towards democratic principles, institutions and participation. - Ability to recognize possibilities of democratic actions and willingness to actualize them. - Orientation on reality that leads to accepting limits of democratic principles. The development of democratic competence is an emphasized overarching theme of learning in schools in European countries (comp. Kerr et al., 2009). However, there is lack of assessment and evaluation of output for this competence. At the University of Salzburg, research led to a general concept of competence. It aims at making competence measurable within the restrictions of standardized test situations in schools. Therefore, the combination of knowledge/skills and motivation (Weinert, 2001) was supplemented by self-efficacy. This concept was applied to democratic competence and a measurement instrument was developed. The paper presents results from the pretest in an Austrian high school (n=155). (1) General suitability for usage with 15-year-olds. (2) Measurement quality (reliability, factor structure). (3) Preliminary results indicate that there are an alarming number of pupils unaware of principles of democratic systems and pupils who agree to anti-democratic statements. Kerr, D. et al. (2010). ICCS 2009 European report. Amsterdam: IEA. Weinert, F. (2001). Vergleichende Leistungsmessung in Schulen - eine umstrittene Selbstverstänndlichkeit. In F. Weinert (Ed.), Leistungsmessungen in Schulen (pp. 17-32). Weinheim, Basel: Beltz.

Does students' nationality affect predictive validity of school placement decisions?

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In Luxembourg, school placement decisions made at the end of primary school determine the track a student will attend in secondary school. About one-third of the students in Luxembourg come from families with an immigration background. Research has shown that this demographical factor influences school placement decisions, as students with an immigration background are more likely to be oriented towards a lower track than are native students (e.g., Ditton, Krusken & Schauenberg, 2005). It seems reasonable to assume that immigration background may also moderate the predictive validity of school placement decisions. In the present research, we examined whether students' nationality moderates the predictive validity of school placement decisions in Luxembourg.
We compared school placement decisions of five cohorts of students with the tracks they attended three to five years later. Subgroup analyses revealed that the predictive validity of school placement decisions was actually affected by nationality. Kappa coefficients (Cohen, 1960), expressing the closeness of the relationship between placement decisions and the actual track, were higher for Luxembourgish students than for students of other nationalities. Additionally, multilevel logistic regression analysis showed that Luxembourgish students were more likely to keep the track than immigrant students.

The impact of portfolios as a tool for Assessment for Learning on students’ (meta)cognitive skills

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One of the most important goals of education is to equip students with the habits and skills that enable them to steer their own learning process. In this respect, Assessment for Learning (AfL) is considered a vehicle to stimulate students in developing a repertoire of (meta)cognitive strategies to become more effective and self-regulated learners. Especially the importance of monitoring student progress and providing scaffolds on how learning can be improved are critical components of AfL. In order to integrate AfL in classroom practice portfolios have been advocated. While both AfL and portfolio assessment have been hypothesized to enhance students’ (meta)cognitive skills, empirical research investigating this relation are scarce, especially in the context of elementary education. This study investigates whether perceived AfL practices of monitoring and scaffolding on the one hand, and portfolio assessment on the other hand enhance students use of (meta)cognitive skills. Data were collected from a total of 564 grade 4 to 6 students from seven elementary schools across the Netherlands. Multiple regression analyses were conducted on the dataset. The results show that portfolio assessment as a tool did not contribute to the development of (meta)cognitive skills, while the core AfL activities monitoring and scaffolding did predict (meta)cognitive skills. This supports the claim that portfolios will only promote learning when it supports the integration of AfL in classroom practice.

The impact of early reading and mathematics skills on later achievements

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Early reading and mathematics learning has been receiving growing attention as performances in the first grades strongly influence later achievements. This paper aims at exploring the relationships between the achievements of reading and mathematics measured in Grade 2 with achievements measured in later school years. The analyses of this study utilize a merged data set of two large-scale assessment programs. For the Hungarian Educational Longitudinal Program (HELP), a representative sample of students (N>5000) was drawn when entering schools and several cognitive tests, including reading and mathematics were administered to them later in every school year. In the framework of the National Assessment System, they were assessed in Grade 6 and 8 in reading and mathematics. The results of Grade 2 HELP tests strongly correlated with the Grade 6 and Grade 8 test results both in reading (r=.591 and r=.573) and in mathematics (r=.635 and r=.611). A more detailed path analysis indicated lower direct relationships between Grade 2 and grade 8 achievements, while stronger ones between the Grade 2 and Grade 4 results. The direct impact of Grade 2 reading on Grade 8 mathematics is also relatively low, while there is a stronger connection between Grade 8 reading and Grade 8 mathematics; so the observed relatively high correlation between early reading and later mathematics may also be attributed to indirect impacts. Our results have confirmed the significance of early education, but no indication of the dominant role of reading was found.

The development of an instrument to measure children’s systems thinking

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Systems thinking is a higher order thinking skill required to meet the demands of social, environmental, technological and scientific advancements. Science abounds in systems and makes system function a core object of investigation and analysis. As a consequence, teaching in science can be a valuable framework for developing systems thinking. In order to approach this methodically, it becomes important to specify the aspects that constitute the construct of ‘systems thinking’, design curriculum materials to help students develop these aspects, and develop instruments for evaluating students’ competence and monitoring the learning process. The present study aims at the development of an instrument for standardized assessment of systems thinking. It draws on a methodology that follows a cyclic procedure for instrument development and validation. Currently, the assessment instrument is in the second cycle of field testing, having collected data from about 1000 students and having used these to develop a first version of a validated test and a scale for measuring 10-14-year-old children’s systems thinking.

The Level of Cognitive Activation in Tasks set in Mathematics Tests
The study presented investigates the level of cognitive activation of tasks set in both class tests and in state-wide exit exams taken in mathematics in Germany. Its empirical results hint at the necessity to improve the way tasks are chosen for both types of tests.

Elearning and assessment in Higher Education: promoting authentic assessment strategies online

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The emergence of e-learning as a strategy for teaching and learning is presently unquestionable. In spite of the lack of consensus around the models and practices that can be adopted in the implementation of e-learning, its current expansion has been responsible for the emergence of new assessment practices that diverge from traditional approaches to assessment. In fact, the growing development of virtual learning environments has fuelled the appearance of new alternative assessment strategies, of a digital nature, as opposed to traditional assessment strategies, established in face-to-face settings. This paper presents a research project focused on alternative assessment strategies, questioning their adequacy and validity for higher education virtual learning environments. This research aims to address particular relevant aspects related to this area including: (i) which modes and strategies of assessment to use in higher education virtual learning environments; (ii) how to define the authenticity of the assessment strategies; (iii) which indicators to use in order to warrant the validity of digital assessment strategies; (iv) how to equate the relationship between the certification of competences and the use of alternative assessment strategies in higher education virtual environments. A case study methodology was used centred on an online program for teachers’ professional development. Preliminary results are presented making use of a new conceptual framework for assessment in HE virtual environments (Pereira, Oliveira & Tinoca, 2011) and illustrating the participants’ recognition of the authenticity of the proposed assessment strategies, emphasizing their formative characteristics.

The impact of study programs on freshmen’s academic achievement: a multi-level analysis

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Academic achievement in higher education has been extensively documented in the literature. In this line, many variables were identified as strong predictors of academic achievement. Yet, contextual factors have often been left out of the investigation. Moreover, the majority of studies have tested a general model assuming that the effects are the same in different programs. However, differences between institutions or programs could result in specific learning contexts leading to different achievement processes. As an attempt to overcome this limitation in the literature, the current study has investigated the impact of study programs on academic achievement through a multilevel analysis. The analyses were carried out on 1137 freshmen from 20 study programs at the Université Catholique de Louvain in Belgium. Results highlighted that achievement interclass variation is about 14% and that the predictors of academic achievement are not the same from one program to another. The implications and limitations of this study are discussed in the conclusion.

Building an effective community of learners: A longitudinal study in higher education

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The present project addresses the extent to which students’ voluntary participation in a community of learners affects students’ development of academic skills and student-to-researcher identity transition through peer feedback practices. Participants (N = 51) are international graduate students (two cohorts of 26 and 25 students respectively) of a Learning Sciences Master’s programme. A Design-Based Research (DBR) approach was adopted for the design of the community, as it allows for simultaneous refinement of the educational and research design on a longitudinal basis. In parallel to the four-semester (2-year) Master’s programme, the community members practice academic skills that are not explicitly taught in the Master’s programme (e.g., presentation skills), during two-weekly ‘community events’. This contribution concerns the identification and investigation of the effectiveness of the community of learners based on a set of principles for the design of effective learning communities and the experienced value of participation. Multiple data sources and analysis methods (triangulation) are applied, such as video-recordings, questionnaires, and personal narratives. Preliminary findings reveal that an effective design of the community was achieved, as reflected in students’ responses to a ‘community principles’ questionnaire and students’ personal value narratives.

Sampling Issues for Using Science Notebooks to Assess Student Learning

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Among numerous efforts to improve students’ science learning in schools, student notebooks have been proposed and investigated as an instructional, unobtrusive assessment tool (e.g., Aschbacher & Alonzo, 2004; Ruiz-Primo & Li, 2004; Shepardson & Britsch, 1997; Wiebe et al, 2009). This paper explores the sampling issues of scoring notebooks so that notebook scores can be reliable interpretation of student learning at individual level and class level. We apply the Generalizability (G) theory to explore sampling facets of lesson, rater, and student within class, and provide empirical evidence on the effects of these facets and their interactions on measuring student learning. Using the student x (entry : lesson) x rater design and other related designs, we conducted G studies to address whether: (1) well-trained raters can reliably score students’ notebooks entries; and (2) student performance was consistent across lessons and parts. We observed the main source of measurement error was lesson rather than rater or entry. The result suggests at least two lessons need to be sampled when scoring student notebooks while only one rater and one part is needed. The findings are consistent across the grades. Regarding the sampling design for the class level interpretation, fewer students need to be sampled for elementary level than secondary level, indicating less variation within class than between classes for elementary classes.

**Reading literacy and immigrant background: The case of Greece**

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The last two decades a large number of immigrants came to Greece, which led to a change of students’ population. However, research on immigrant students’ academic achievement in Greece is very limited and findings from other countries with significant immigrant population vary. Therefore, there is an urgent need for a systematic research on immigrant students’ achievement in Greece in order to identify their educational needs, so as to develop educational policies that hold within the Greek context and lead towards equity in learning. The present study analysed immigrant students’ reading literacy in order to examine whether the findings of previous research that pointed to a need for a stronger language support policy at schools are supported when the focus of the assessment is specifically on reading and whether other factors are linked to immigrant students’ achievement in Greece. The study analysed the Greek data from PISA 2009, using multilevel modelling analysis, with fixed and random slope models. Factors that were taken into account consist of the language spoken at home by students, the socio-economic status of students and schools, the percentage of immigrant students in schools and whether students had extra-curricular language support. Overall, the results of the present study indicate the existence of educational inequalities in Greek education system and suggest directions for further research and educational policies’ development.

**Cognitive processes underlying the comprehension of mathematical word problems**

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Mathematical word problem solving plays a prominent role in contemporary mathematics education. The importance of mathematical word problems is that they, by connecting to the experiences of children, trigger informal solution methods, which form the basis of formalizing the mathematical operations. In the present study we examined two cognitive processes that underlie mathematical word problem solving. The first cognitive process involves the production of visual-schematic representations, lies in the visual-spatial domain, and is strongly associated with spatial ability. The second cognitive process is rather language-related and involves the ability to map mathematical terms onto mathematical operations. This process is associated with reading comprehension. We examined both cognitive processes in one theoretical model, using path analysis. The results showed that both the production of visual-schematic representations (with spatial ability as the fundamental determinant) and the mapping ability (with reading comprehension as the fundamental determinant) lead to a higher word problem solving success. The results contribute to the development of instruction methods that help students using these processes while solving a mathematical word problem.

**Using a bottom-up approach of teaching to overcome the heuristic misinterpretation of box plots**

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In this paper we studied an intervention aimed at remediating students’ tendency to interpret the area of the box in box plots as representing the proportion or number of observations. This reasoning is incorrect as this area shows density. This misinterpretation has been shown to be caused by heuristic reasoning, triggered by the saliency of the area of the box. A study with expert users of box plots has shown that even people who frequently use box plots are prone to this incorrect interpretation of box plots. Using a bottom-up approach of teaching, we tried to improve students’ interpretation of box plots. We found that most students showed improvement after the intervention, although signs of heuristic reasoning were still found, both in the accuracy rates and reaction times. The intervention was hence not able to alter these participants’ heuristic reasoning.
concerning box plots, although it did help these participants to give correct answers. This means that under some circumstances, such as under time pressure or when less attentive, these participants could still be prone to reason heuristically and hence interpret box plots incorrectly.

**Student Views of Oral Assessments in Undergraduate Mathematics**

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This paper investigates mathematics students’ perceptions of oral assessment in a UK university. One item of traditional written coursework in a first year Graph Theory module was replaced with a one-to-one oral assessment session. A week later, students completed a questionnaire based on the Assessment Experience Questionnaire (Gibbs and Simpson, 2003) which asked them to compare their experience of oral assessment with that of weekly exercise sheets and closed book exams. We found that mathematics students believe that oral assessment fosters understanding more than weekly exercise sheets, involved them in more thinking and more synthesis of material. Analysis of their written responses suggested they value the immediacy and quality of feedback obtained from oral assessment, as well as the individualised nature of the assessment. The comparison with closed book examination however reveals that these students still view this very traditional method as the ‘gold standard’ for the assessment of mathematics. The findings of his study are of relevance assessment in higher education in general and for mathematics assessment in particular.

**Proof type – The teacher’s preference or the expression of adaptive lesson planning?**

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Within the project ‘Instructional dialogues and learning outcomes in problem-oriented mathematics teaching’, this study examines, in 32 8th/9th-grade classes, which proof types were realised for the same inner-mathematical problem. Moreover, we investigate possible associations between the proof type used and the school type, as well as teacher characteristics. Results indicate that the proof type employed is more a personal preference of the teacher and less an adaptive lesson planning regarding the school-type level.

**Dealing responsibly and effectively with students’ religious beliefs in science lessons**

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There is currently a vigorous debate in several countries about whether, and how, religious beliefs should be tackled in the science classroom. It revolves around sensitivities about the religious, cultural and ethnic backgrounds of students and is exemplified by the teaching of evolutionary theory. There have been recent concerns over calls to teach creationism or intelligent design alongside evolution in school science. This paper focuses on how students in England accommodate any differences between their own religious or cultural beliefs and coverage of the origins of life in school. Mixed methods were used: as well as a small national survey of Science teachers, four schools were selected for the study (one a Christian faith-based school, one drawing mostly from Muslim families, and two with mixed catchment areas). Students’ views and beliefs were elicited using questionnaires and focus groups, and some teachers were also interviewed. Based on the findings, a typology is proposed which reflects differing propensities to engage with the science/religion interface as represented by this topic. The study indicates that teachers need to be sensitive not only to the students’ cultural backgrounds, but also to how individuals might conceptualise the inter-relationship of science and religion. It argues that responsible teaching strives for student understanding of evolutionary theory rather than its acceptance, allowing those who might otherwise be alienated to participate in sustainable learning. It applies the theoretical framework of cross-cultural border crossings to suggest a responsible and effective approach to teaching this contentious topic.

Developing Pre-Service Teachers’ Evidenced-Based Argumentation skills on Socio-Scientific Issues

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We report a study of pre-service teachers engaged in a dialogic activity in the topic of Climate Change. Participants collaborated with a same-side peer in arguing against successive pairs of peers on the opposing side of an issue. Dialogues, as well as reflective activities, were conducted in a learning environment developed by a group of teachers and researchers for the purpose of the present study. Participants showed significant advances in their skill of producing evidence-based arguments, both at the procedural level and at the meta-level. Advances were also observed regarding the accuracy of the evidence used. The present findings have important implications for science teacher education.

Understanding Photosynthesis in University Studies

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In this study, university students understanding of photosynthesis was examined in a large introductory class of bioscience studies. Altogether, 171 students participated in the study. The focus was on the effect of text design on conceptual change. The study was based on a pre- and posttest design, thus, students’ prior knowledge of photosynthesis was measured first by ten open-ended questions concerning photosynthesis. Then, after reading either a refutational (systematically pointing out how the misconceptions contradicts scientific concepts), or a non-refutational text the students’ knowledge was tested by using the same test instrument. Results showed that students’ prior knowledge and understanding of photosynthesis varied a lot. When compared all students’ success in the pretest and posttest with paired samples t-test, it became apparent that the scores increased statistically highly significantly after reading the text. Participants with poor previous knowledge who had read a refutational text improved their scores indicatively more than those who had read the non-refutational text. Our study suggests that university educators could use refutational-texts as an effective and cheap tool in enhancing conceptual change concerning the key concepts, such as photosynthesis, especially among the non-major students whose prior knowledge contradicts with scientific knowledge.

Science popularization increases lay readers’ reliance on their own decision abilities

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When science knowledge is communicated to the lay public, this is usually done in a ‘popularized’, i.e. simplified manner in order to make scientific knowledge accessible for the lay audience. However, while such simplification may enable laypeople to follow what is being said, the ease of understanding may also make them overestimate their ability to decide about the veracity of topic-related claims and discount their actual dependence on experts. The present study was aimed at extending and ecologically validating previous findings which have shown selected features of popularization to increase laypeople’s reliance on their own decision abilities. This was done by presenting adults from different educational backgrounds with authentic articles from two text genres varying in their degree of simplification, ‘scientific articles’ addressed to an expert audience and ‘popularized articles’ addressed to laypeople. We found that in line with our expectations, reading popularized articles led participants to agree more strongly with contained knowledge claims than reading scientific articles about the same topic. In addition, participants were more confident in their claim judgment, showing a weaker desire for expert advice. Educational implications for the communication of science knowledge to the general lay public are discussed.

Risk-based Educational Accountability in Dutch Primary Education

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A recent development in educational accountability is a risk-based approach, in which the intensity and/or frequency of school inspections vary across schools dependent on the risk level of a specific school. A risk-based inspection system is considered to be more effective because it enables inspectorates to focus on organizations at risk. In this article we assess which characteristics of primary schools are relevant in predicting which schools are ‘at risk’ and how robust a risk model is over multiple cohorts based on an empirical analysis of 500 Dutch primary schools. At risk schools were defined as schools performing significantly below average on achievement and value added indicators. The composition of the school, previous performance, a systematic approach and evaluation of effects of extra care and monitoring the performance of students appear as the best predictors of underperformance of the primary schools in the sample. The results indicate that, if risk models for predicting underperformance of primary schools would be applied in the context of educational accountability, a large number of schools need further investigation to find nearly all underperforming schools.

**Changes to the Romanian Baccalaureate Exam: Effects on Students’ Academic Attainment**

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The present paper investigates whether a recent change in the structure and content of the Romanian Baccalaureate has affected students’ academic attainment in the Exam when controlling for students’ previous achievement, as well as their gender, schooling environment and their schools’ socio-economic deprivation levels. Data from 6373 students in fourteen schools across six exam cohorts are used to estimate a multilevel linear model that accounts for students’ grouping into schools and assesses the impact of the type of exam sat against the other variables. The findings point to a significant negative effect of the type of exam on students’ Baccalaureate scores, whereby the most recent cohorts score substantially lower than previous ones. Additionally, this effect appears to be increased by school’s socio-economic deprivation, so that it is the children pursuing education in more disadvantaged context who have been most affected by the change. Implications for further alterations to the examination strategy are briefly discussed, promoting an evidence-based approach.

**ICAP in Action: Translating a Theory of Cognitive Engagement to Increased Classroom Learning**

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ICAP is a theory of cognitive engagement that proposes that interactive (I) activities are better for learning than constructive (C) ones; constructive is better than active (A), and active is better than passive (P) (I > C > A > P). This theory was developed based on a number of classroom and laboratory findings; however this is the first program of research to investigate whether middle and high school teachers can be taught the theory and in turn develop classroom activities which align to varying levels of the ICAP framework. We conducted a weeklong teacher training in which we introduced the framework and provided workshop time for teachers to develop or refine existing lessons as well as develop assessment measures. During the school year, teachers taught the ICAP-based lessons to two or more classes and administered the pre- and posttests. In this talk, we will focus on two activities: one conducted in a high school chemistry class and the other in a middle school US History class. Results from both lessons support the ICAP framework and show that the higher-order cognitive engagement activities (interactive) resulted in greater learning compared to active and constructive tasks (p=0.02 (chemistry); p=0.02 (US history)). In addition to these two units, data from two other teachers were collected and analyzed. While significant learning as measured with pre- and posttests was observed, there were no significant differences between conditions. These unexpected results help to identify boundary conditions of the framework and will also be discussed.

Evaluation of a Seven-Year-Program on Fostering Reading Literacy

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The reading literacy levels of 15 year old students in the northern state Schleswig-Holstein are substantially below the OECD average. For a quarter of the students it is unlikely that they are able to use reading as an independent tool in acquiring knowledge and skills in other areas. On the basis of these alarming results a program fostering reading literacy was developed with the aim to increase the results in reading literacy for secondary school students. The program in Schleswig-Holstein works on four different levels: additional teaching, providing specific material, guidance for the headmaster in project management, supply of assessment tools and teacher training. In the program all over 200 secondary schools are involved. For the evaluation purpose of the program a group of students was assessed in a longitudinal study from the fifth to the eighth grade. Additional surveys to assess the acceptance and variety of the realisation of the program in schools were conducted. Headmasters, teachers and students appreciate the program. Reading literacy increased in most of the schools. The increment of growth exceeds the gain other achievement studies imply. However the effects of the program vary very much between the schools in the program. Further investigations trace the effects of the different parts of the program.
Art-based business learning in higher education: connecting artistic and economic knowledge domains

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Aim of the paper is to explore how bridging the artistic knowledge domain facilitates the construction of knowledge and understanding of business economics. Based on the analysis of learning diaries of arts students in a course on accounting, the paper concludes that the understanding of business economics was enhanced by searching the analogical structures and processes between the arts and business economics. Also, the artistic analogies revealed the level of the students’ understanding of business economics concepts. The paper contributes to the discussion of transformative learning in which the elements of different fields are translated for better understanding. This new pedagogical knowledge about interdisciplinary approaches to teaching and learning provides possibilities to develop new arts-based teaching methods in higher education.

Attitudes towards education – on the subjective sense of school and formal education

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Education is of great significance in the modern society as an orientation category and a resource. In Germany it has clearly gained in relevance once more in the course of the controversial discourse conducted in the wake of the PISA study. Yet does the importance attached by students themselves to school and formalised education correspond to this objective rise in significance? This question was at the centre of an empirical survey of 1689 students in grades 7 and 9 at schools in disadvantaged areas in the Bremen region in Germany. The paper reports on the central findings of the study and discusses the extent to which attitudes towards school are preformed, for example by cultural capital, social origin or immigrant status.

What do children can learn about green technology in ‘the solar toy workshop”? An exploratory study

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Children are regularly involved in museums, exhibitions and workshops about green technology. Our research takes place in Switzerland, in a DIY activity organised by experts in photovoltaic development. The explicit aim of the activity is for children to design, build and adapt a solar toy of their own mind within 2-3 hours, for instance a boat or a little merry-go-round. Many tools and materials are available, and adults just help children to use these objects to make their desired toy. During three different sessions of this DIY activity, we interviewed 25 children aged 8 to 13 y.o.. A pre-test/post-test exploratory study, based on interviews about the sun, the solar energy and the solar cell, allow us to interpret children conceptions before and after the activity. Results indicate minor changes in solar energy and solar cell conceptions after the activity: for instance, some children have become able to focus on physical devices of the green technology such as electrical wires, or can sometimes remove or integrate the role of the sun in their explanations. Some of these naïve conceptions about the physical domain can be explained by previous research on electricity or movement. Finally, our results highlight some specific difficulties in the children understanding, directly related to the solar technology. We conclude on new questions about the way children think about solar energy and how to investigate this new domain.

Influence of Prior Beliefs and Reading Goal on the Validation and Understanding of Multiple Texts

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When learners inform themselves about currently debated scientific issues, they will read multiple texts that are more or less belief-consistent. We predict that learners monitor the consistency of incoming information with their prior beliefs and will engage in strategic validation of incoming information if they follow a reading goal that requires an understanding how things really are (epistemic reading goal). In this case, we expect that the validation and understanding of arguments that run counter learners’ beliefs should be important and hence, should be higher. In the present experiment, the influence of learners’ reading goals on validation processes and on the situation model in comprehending multiple belief-consistent and belief-inconsistent texts were investigated. For this aim half of the participants received an epistemic reading goal instruction, whereas the other half received a receptive reading goal instruction. Subsequently students read one belief-consistent and -inconsistent text each about a scientific issue while thinking aloud. Afterwards situation model strength for each text was assessed with a recognition task. In line with our assumptions, learners following an epistemic reading goal had a stronger situation model for the belief-inconsistent text. In addition, these learners also used more validation strategies during reading the belief-inconsistent text.

Beliefs about excellent teaching and assessment among Chinese pre-service teachers

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Pre-service teacher beliefs about teaching and assessment are unlikely to be the same as practicing teachers for lack of experience in the instructor role. Chinese teacher beliefs are strongly shaped by the high-stakes examination system of China. Pre-service teachers in four universities were surveyed with the Teacher Conceptions of Excellent Teaching and Teacher Conceptions of Assessment in Chinese contexts inventories. The models based on practicing teacher responses were rejected and new models were developed and tested. The revised TE-TCET model for teacher education students consisted of four inter-correlated factors (i.e., Caring, Exams, Professional, and Intellectual), while the revised TE-TCoA-C model had four factors (i.e., Diagnose & Formative, Irrelevant, Control, and Life Character), with three latter factors predicted by the Diagnose & Formative factor. The structural model found that the TE-TCET Exam factor predicted three of the TE-TCoA-C factors (i.e., positive paths to Irrelevant and Life Character and negative path to Diagnose & Formative). Examination preparation was strongly correlated with caring for students. Assessment was conceived primarily around diagnostic and formative functions. The structural paths indicated that teaching for examinations was not identifying and responding to student strengths and weaknesses. The moderate path to Life Character was consistent with the Confucian notion that doing well on examinations is an expression of moral and personal virtue. These results suggest, despite the dominance of examinations in Chinese society, that pre-service teachers have a commitment to assessment for learning.

**Relationship of Epistemological Belief and Program Learning Environment Across a two-year curriculum**

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Epistemological beliefs are robustly found to predict quality of learning process and outcomes. Empirical studies of interventional nature have been conducted to explore pedagogies that may help fostering epistemological beliefs and results were promising. However, the sustainability of such effected epistemic change across students' years of study is largely unexplored. In light of this, the global climate or learning environment of program where students situate across years of study may be relevant to our understanding of epistemological beliefs advancement. The aims of the present study is to explore the relationship of students’ perception of program learning environment (measured by Student Engagement Questionnaire; Kember and Leung, 2009) and its relationship with epistemological beliefs; and also to track students’ changes on these variables across a two-year associate degree curriculum. Correlational analysis show that an affective dimension (Student-teacher Relationship) in learning environment is relevant to fostering epistemological beliefs. Furthermore, MANOVA results also suggest changes in two dimensions of epistemological beliefs (Development and Justification) across the two-year curriculum. Implications on academic development, curriculum planning in relationship to designing a program to foster epistemological beliefs will be discussed.

**The ‘Change-Change” Assumptions in the Control-Value Theory of Achievement Emotions**

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Emotions are assumed to play a central role in learning processes. The Control-Value Theory of Achievement Emotions (CVTAE) (cf. Pekrun, 2000; Pekrun, 2006) deems subjective competence and value beliefs to be central antecedents of emotions. Moreover, the CVTAE postulates that changes in emotions can be achieved to a large extent by influencing, or rather changing, their competence- and value-related antecedents. It is further assumed that the way in which significant others (e.g. parents) interact with children influences their competence and value beliefs. In terms of child-rearing practices, the contribution focuses on two key dimensions of parenting: exercising control and providing structure. There is empirical evidence that parental control, or the perception thereof, negatively influences competence and value beliefs, whereas parents’ provision of structure, or the perception thereof, has positive effects. By means of latent-change models, the contribution examines the ‘change-change’ assumptions that changes in children’s perception of parental control and provision of structure bring with them changes in the children’s competence and value beliefs. Data are analysed of approximately 431 students. Data collection took place from November 2008 to September 2010 during the sixth, seventh and eighth school year (six rounds of data collection). In first analyses, the ‘change-change’ assumptions are at least partially confirmed. The marginally significant effects can be theoretically explained. All in all, the results indicate the importance of children’s perception of parental control and structure for their competence and value beliefs.

Development of primary school teachers’ epistemological beliefs within science education practice

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This study aims to investigate the beliefs of seven primary school teachers referring to their beliefs about learning and instruction in general (PCK) and about their beliefs concerning science education especially (SPCK). Epistemological beliefs strongly influence and sometimes regulate classroom performance and teachers’ view about how learning should take place. Therefore, they are good predictors for teacher action. In science education it is extremely important to initiate constructivistic learning opportunities. As this depends on the teachers’ epistemological beliefs it is necessary to gain insights of existing beliefs and detect possibilities of their development. Whether and in what aspects epistemological beliefs of the sample teachers change over time by continuously reflecting their own teaching practices are important considerations of contemporary research, and the main issue of the current study.

Work Motivation in School: Predictors of Beginning Teachers’ Intent to Leave

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Recent trends show that many beginning teachers leave the teaching profession early in their careers. This paper explores individual and contextual factors that may predict beginning teachers’ intention to leave the teaching profession. Our results show that the collective teacher efficacy, role
conflict and affective commitment are three important predictors for beginning teacher intent to leave. Our findings are somewhat surprising, as they show that the organizational and contextual factors have a significant impact on beginning teacher intent to leave. One important implication of our study is that we should be careful in assuming that the same factors that predict teachers’ job satisfaction and retention will also apply for beginning teachers, as our results only partly support previous findings.

Student and teacher conceptions of autonomy-support: Relations with motivation and achievement

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Abstract
According to Self-Determination Theory (Deci & Ryan, 1985), motivational teacher practices that support students’ autonomy are believed to foster students’ motivation and learning outcomes (Vansteenkiste et al., 2004). By combining quantitative and qualitative approaches, the present study aims to gain a more thorough understanding of ways in which teachers support students’ autonomy. Both student and teacher conceptions of autonomy-support were examined and related to developments in students’ motivation during the last year of primary school. Autonomy-support was examined qualitatively through interviews with nine grade six teachers and quantitatively through student questionnaires (N=192). At the beginning and halfway through sixth grade, several aspects of students’ motivation, i.e., task-orientation, self-efficacy, and school investment, were assessed through questionnaires. Standardized achievement scores were collected from the schools. Results showed that teacher and student conceptions of autonomy-support did not correspond. Surprisingly, students from controlling teachers experienced more autonomy-support than students from more autonomy-supportive teachers. Furthermore, multilevel analyses showed that in classes of more autonomy-supportive teachers, students showed more growth in school investment, but less growth in achievement. When students reported more autonomy-support they showed more growth in task-orientation and self-efficacy. The unexpected relationship that was found between teacher and students conceptions of autonomy-support indicates that teachers and students may have different understandings of autonomy-support, and raises important theoretical questions that will be addressed further. The meanings students ascribe to autonomy-supportive teaching will be explored further and compared to teachers’ understanding of autonomy-support in order to explain these findings.

Early Beginnings of Adult Competence: Roots of self-regulation and manifestations during Adulthood

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The aim of this presentation is to analyze the development and manifestations of self-regulation using the data of the longitudinal study ‘Family Development in the Course of Life’ (FIL), originally including 175 families (waves, t1: 6th month of pregnancy, t2: child’s age 3 months, t3: 3, t4: 8, t5: 11, t6: 15, t7 18 years). To measure self-regulation at t7, we used the scale ‘Effortful control and determination’ (ECD). To identify trajectories we conducted a PLS path analysis. A factor that proved to be salient at all waves was the development of the mothers conceptions of their own role. Difficult temperament of the child at t2 and the ensuing caregiver stress had a long-term negative influence on ECD at t7. Partnership happiness at t4 had a strong influence on attachment at t7, which proved to be the most important influence on ECD at t7, this result is of major relevance. A cluster analysis (Ward’s procedure) led to 3 types of young adults. Group 1 and 2 had significantly higher scores on ECD. Type 2 infants however were significantly more ‘difficult’. Group 3 proved to be a group of youngsters at risk. At t4 f.i. this group had the highest scores on PPT and at t7 the most problematic relationships with their mothers and they the lowest expectations concerning their future life. As these results demonstrate, competent self-regulation during the transition to emerging adulthood is the outcome of a complex history of interactions of care-giver-specific and child-specific influences.

Competing developments of Time Perspectives on School and Professional Career and Leisure

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Starting secondary education at age 12 in the Netherlands, students’ future time perspectives on school and professional career, school motivation and academic achievement have been found to decrease while their long-term perspectives on leisure increase (Peetsma & Van der Veen, 2011). This might indicate a competing relation between developments in perspectives on school and professional career and perspectives on leisure. In the study of Peetsma and Van der Veen in the vocational track no indications for competing domains were found. In the present study the possible competitiveness of the domains was investigated for all levels of secondary education. 701 students in the first two years of secondary school participated in this study. They filled in a self-report questionnaire on short- and long-term perspectives on both domains, five times in a period of two years. The relationships between the developments of perspectives on leisure and school and professional career and achievements were analysed, using multivariate Latent Growth Curve Analyses (LGCA) with Mplus, multi-group for students from the lowest and highest levels of secondary education. Neither in the low nor high level of secondary education a competing relation between the developments of future time perspectives on leisure with that on school and professional career was found. The short term perspectives proved to be more important for the academic achievements of students in low level schools while the long term perspectives were more important in high level schools.
The Relationship of Pedagogical Knowledge and Pedagogical Content Knowledge in Teacher Education

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In today’s knowledge-based societies inert knowledge is a central issue. One common source of inert knowledge is the encoding of abstract principles without reference to application. Despite this insight, however, curricula in teacher education often remain separated into courses of pedagogy and content. The present study analyzes the effects of providing general pedagogical knowledge and pedagogical content knowledge in an integrated or separated way. We assume that general pedagogical knowledge can hardly be applied in unknown domains, unless it is in some way connected with pedagogical content knowledge of a familiar domain. Sixty mathematics student teachers completed first a working memory task and a pretest on prior knowledge. Then they worked on a computer based learning environment in two conditions (integrated vs. separated). Finally, they completed a posttest on learning outcomes (ten rapid assessment items and ten open questions). As predicted, student teachers of the integrated condition could better apply their general pedagogical knowledge to analyzing problems of mathematics classroom teaching than student teachers from the separated condition. Furthermore, the integrated presentation led to an increase of applying both perspectives (i.e., general pedagogical knowledge and pedagogical content knowledge) at a time. The positive effects were not moderated by prior knowledge and working memory capacity. Taken together, our results indicate that integration can not only increase the applicability of general pedagogical knowledge but also enhance the parallel use of both knowledge types whereas positive effects are not dependent on prior knowledge or individual working memory characteristics.

Teacher Knowledge for Teaching and Student Learning: Exploring Connections

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Teacher knowledge has for long been considered a key contributor to student learning. However, empirical findings regarding this link have been mixed. In this exploratory study, we focus on the domain of fractions and explore how teachers’ knowledge for teaching fractions contributes to
student achievement gains in the same domain. To this end, we administered a test measuring fifth-graders’ performance in fractions twice. The teachers (N=39) of these students (N=674) were also administered a paper-and-pencil open-ended questionnaire measuring their knowledge for teaching fractions with respect to teaching practices such as analyzing student thinking and misconceptions and providing explanations; the content of the teacher instrument was aligned with that of the student test. Using IRT models, we first developed three scales, two capturing students’ ability at first and second test administration and another tapping teachers’ corresponding abilities; the model parameters of each scale were then introduced to a two-level hierarchical linear model. This latter analysis revealed that teachers’ knowledge for analyzing student thinking had a small, yet significant effect, on student learning gains, whereas other teacher background characteristics did not; a similar pattern also emerged for the practice of providing explanations. Our findings support the link between teacher knowledge and student learning with respect to certain teaching practices in a specific content area. In discussing our findings, we point to the importance of aligning the instruments used to tap student and teacher performance, and discuss challenges that inhere in measuring teacher knowledge using open-ended questions.

Towards a common language of teaching

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In contrast with many other professionals, teachers do not have unambiguous terminology with which to discuss their practice. Research and theory on teaching has contributed to this problem through the proliferation of vocabulary and terms to describe teaching. A common language of teaching could both facilitate access to relevant theories and practices for teachers, and support more robust professional conversations. In this paper, we analyze a set of existing frameworks, using Kluge’s method for constructing typologies, to explore the characteristics of existing frameworks, how they have been used in both research and practice, and how they might form the basis for a common language.

Do motivation, commitment and instruction determine achievement in teacher education?

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In the next few years a shortage of Dutch secondary education teachers is expected. This shortage is among others caused by difficulties with retaining preservice teachers in the education programme. Here we assume that the motivation for becoming a teacher is essential in this respect as it has been found to be related to commitment and self-efficacy in the profession. The goals of this study were
threefold; (1) to examine preservice teachers’ motivation for becoming a teacher, their commitment, self-efficacy and perceptions of quality of the programme, (2) to examine gender and age based differences in motivation, self-efficacy and commitment and (3) to determine which factors determined achievement in the teacher education programme. 82 Dutch university-based pre-service teachers filled out a questionnaire which included their motivation for becoming a teacher, classroom and school teaching self-efficacy, professional commitment and perceptions of the quality of the programme. Retention was measured in terms of academic achievement after 12 months. The most important motivation for becoming a teacher was teaching ability. Furthermore, preservice teachers with a high affective commitment and who were less satisfied with the general quality of the programme obtained their degree within the nominal duration of 12 months. As such our study contributed to the theoretical development of the motivation to become a teacher. It provided more information on how motivation to become a teacher is related to pre-service teachers’ effort, commitment, self-efficacy and the quality of instruction. Furthermore, it related these aspects with academic achievement in the teacher training programme.

Developing an oral pedagogy framework for teaching assistants

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Teaching assistants (TAs) have taken increasing responsibility for teaching and learning, particularly for those pupils with Special Educational Needs or who are not making expected progress. However, it has been established that there is an overall negative impact of TA support on pupil attainment. It has been shown that TAs focus on task completion and provide high levels of support in relation to the individual difficulties experienced by members of the group (Bosanquet, 2012; Radford, Blatchford and Webster, 2011), a situation likely to contribute to this negative impact and develop pupil dependency on adult support. It is argued that an oral pedagogy framework is required which can be used to clarify and support the role of the teaching assistant, in order to improve the learning experiences of the pupils. This should focus on the moment-by-moment interactions, as social-constructivist theory indicates that it is in these interactions that shared meaning is negotiated and scaffolding provided. The beginnings of a suggested framework are discussed, and illustrative examples shown.

Argumentation in science learning in Chilean primary education: An efficacy study

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Since the late 1990s, there has been consensus among educational researchers that argumentation should play a central role in science education. Moreover, there is some compelling evidence show that argumentative discourse has benefits both for science learning and thinking development. This study was aimed at contributing to this literature evaluating the effects that argumentation during science teaching has on science learning, argumentation development and students’ attitude toward science, in Chilean primary education (5th grade). We conducted a quasi-experimental study working with two groups of teachers and 5th grade classrooms (10-11 age), one of which teach the unit of Force and movement according to lesson plans specially developed to foster argumentation in the classroom (intervention group). Pre and post evaluations of students’ science learning, writing
argumentative skills, and attitudes toward science, were conducted. 19 teachers and classrooms (13 in intervention groups) and 231 (166 intervention group) participated in the study. Multilevel regressions showed that oral argumentation has a small but statistical significative effect on science learning as expected. However, initial levels of written argumentation skills was the variable that has stronger effects on science learning. These results were unexpected and suggest the strong relation between written argumentation skills and science learning.

Disruptive Dynamics of Students’ Interpretation of a Learning Task: An Activity-Theoretical Analysis

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Often educational research takes tasks for granted; how students interpret a task and what are the implications of such interpretation is seldom discussed. Through utilizing the activity-theoretical concept of personal sense, this study analyzes interpretative dynamics at play when primary students face learning tasks over a series of lessons. The study shows that disruptions at multiple levels occur that hinder the students’ possibilities of elaborating their personal sense of the task and its contents. The study brings forth a theoretical conceptualization of interpretative dynamics that involves four layers of disruptions that each have a distinct relationship to interpretation of task. The study has educational implications regarding implementation of novel pedagogies through highlighting students’ perspectives.

Tuning individual and collective dynamics in classroom discussions: An empirical study

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How can we support students in learning not only the disciplinary content of courses like physics, but also in situating their learning in wide and personal projects of intellectual and emotional growth? Previous research (Levrini, Fantini, Tasquier & Pecori, 2011) constructed an empirically operationalizable definition for this broader sense of learning, termed ‘appropriation.’ The current study focuses on the relationship between classroom discourse and individual students’ approaches to appropriation, particularly emphasizing the mediating role of the teacher in orchestrating class discussions.
Optimizing example-based instruction in physics

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The reported experimental study involving 260 secondary school physics students was designed to investigate the efficiency and optimal presentation formats of practical instances of solution principles in worked example-based instruction with learners at different levels of prior knowledge. Two forms of principle-applied instances, - presented prior to the example or embedded within the example, - were used in addition to the control condition without the instances. Since worked examples were used in conjunction with learner problem-solving exercises, the relative efficiency of two instructional sequences (example-problem or problem-example) were also compared. Significant main effects of instructional sequence as well as interactions between the instructional sequence and levels of learner prior knowledge were obtained for most of dependent variables (posttest scores, mental effort, and instructional efficiency). The results demonstrated a superior overall efficiency of the example-problem sequences, as well as higher learning benefits of the worked example with embedded principle instances for novice learners compared to the conventional worked examples.

Effects of Teachers’ Enthusiasm on Students’ Motivation, Emotion, and Recall

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Teachers’ enthusiasm as behavioral expression of underlying joy has been demonstrated to affect intrinsic motivation and positive affect in students, but, until now, effects on performance has not been explored. Present research aimed to assess them with the hypothesis that teachers’ enthusiasm affect not only motivation and emotion, but also recall performance and absorption. Three studies were conducted with fifth graders by comparing effects due to two reading conditions: with or without enthusiasm. Participants had to listen to narrative and descriptive passages read by a teacher showing or not enthusiasm, to provide a reading time estimation, to rate perceived enthusiasm, pleasure, interest, enjoyment, and curiosity, and finally to write a free recall. Experiment 1 showed that in the condition of enthusiastic reading students recalled more, were more motivated, and provided a lower time estimation compared to neutral reading. Experiment 2 confirmed the results with different passages and a larger sample. Experiment 3 demonstrated the involvement of positive affect. Implications for improving the learning environment and suggestion for increasing the expression of enthusiasm are provided.

Students’ attention in different concepts of teaching

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Attention behaviour of students could be influenced by the characteristics of different concepts of learning. Especially experiential learning with its holistic approach and the orientation at real complex problems may have a positive influence on students’ attention and learning. Beside this,
experiential learning could foster the transfer of knowledge and forward the capability in real life situations. The research project aims on the comparison of students’ attention behaviour in different concepts of teaching, in particular more traditional and experiential learning, and students’ learning results. Attention behaviour was video observed and coded with the help of a multiple coding scheme. The observing instrument was tested in a preliminary study. For proofing the validity, retrospective interviews with randomly selected students have been conducted. The instrument allows more than a time-sampling, even a continually data gathering and it indicates the progress of attention behaviour of every student over the whole lesson. Thereby, phases of lessons with critical attention behaviour could be identified. Learning results were measured by knowledge pre- and posttests including items of different levels of cognitive dimensions. Against theoretically based odds, the results showed quite similar attention levels in both concepts of teaching. The results of the knowledge growth of students’ showed superiority for more traditional learning (Hommel, 2012a). Nevertheless, it is necessary to consider, that students’ have to be able to transfer knowledge and to apply it in real life situations.

Exploring Generic and Domain-Specific Factors of Effective Teaching: Secondary PISA Analyses

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Researchers over the past three decades seem to have largely worked in parallel, trying to understand how generic teaching practices (i.e., practices that cut across different subject matters) or domain-specific teaching practices (i.e., practices situated in certain disciplines) contribute to student learning. In this paper, we attend to both types of practices, seeking to explore how this dual focus can help better explain student outcomes. To this end, we conduct a secondary analysis of PISA studies, employing statements that pertain to either generic or domain-specific practices. Our analysis using a three-level hierarchical model to explore the performance of about half a million students enrolled in about 18,000 schools in 72 countries indicated that incorporating both types of practices in such models can explain about twice as much variance in student performance compared to including only one type of practices. In discussing our findings, we point to the importance of integrating such practices in theoretical models on teacher/educational effectiveness and in instruments designed to gauge teaching quality and explore how, in turn, this quality contributes to student learning.

Students’ evaluation of multiple relevance criteria from 6th to 10th grades

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We investigated 6th to 10th grade students’ ability to assess multiple sources features as they study documents online. We hypothesized that topical relevance and the currency of information would be easier to assess than source authority and language level. 46 students read a set of four short texts on science topics and rated each text for 4 different criteria. In addition 35 participants explained their ratings in an interview. Ratings showed an affect of grade on the rating of source authority, currency and language. Content analysis of the interviews were being conducted at the time of submission. The pattern of results suggest that middle school students may benefit form interventions aimed at fostering their identification and use of source features when studying multiple texts.

**Cognitive and Affective Effects in Multimedia Learning: A Moderated Mediation Analysis**

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The present paper presents a multimedia learning study that integrates cognitive and affective aspects. The study gives an impulse for opening the current cold cognition perspective to an integrating perspective in multimedia learning research. Cognitive and affective processes are focused to explain controversial results in seductive details research, sometimes showing the detrimental effect of seductive details and sometimes showing non-significant results. The Cognitive-Affective Theory of Learning with Media assumes that students need to become motivated to make full use of their cognitive resources. Thus, the possible motivational role of seductive details that are interesting, but unnecessary to reach the learning-goal should not be dismissed. Using a 2x3 experimental design participants (N=123) were asked to learn about biology with a multimedia instruction that manipulated the modality of verbal information (text vs. narration) and the presence of seductive details (sds; no-sds vs. textual-sds vs. narrated-sds). A modality effect was found and a moderated mediation analysis with the moderator modality (text vs. narration) and the mediator situational interest shows the moderated mediation with a conditional direct effect of seductive details on learning performance in the text condition and a conditional indirect effect under the narration condition. Results confirm the modality-specific affective mediation assumption leading to an integrative cognitive-affective interpretation.

**Gestures facilitate Learning about Movements with Dynamic Visualizations**

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This study investigates whether viewing gestures facilitates learning about non-human biological movements and whether correspondence between gesture and to-be-learned movement leads to better results than non-correspondence. Functional near-infrared spectroscopy was used to address whether gestures activate the human mirror-neuron-system (hMNS) and whether the activation of the hMNS mediates the facilitation of learning. During learning participants viewed triples of visualizations for four movements (1. animation depicting a fish movement, 2. video with human gestures, 3. replay of the initial animation). Results showed that corresponding gestures were beneficial for low-spatial-ability learners, whereas the type of gesture had no influence for high-spatial-ability learners. Moreover, with corresponding gestures low-spatial-ability learners showed a higher activation of the inferior-frontal cortex, which is associated with the hMNS, than high-spatial-ability learners, whereas with non-corresponding gestures no difference in cortical activation occurred. Furthermore, results showed that, if presented with non-corresponding gestures, learners with low spatial abilities who activated their inferior-parietal cortex, which is also associated with the hMNS, improve their learning. Based on these findings, a positive learning outcome for learning about biological movements is predicted by three factors: high spatial abilities, activation of the inferior-frontal cortex that can be stimulated by corresponding gestures, and activation of the inferior-parietal cortex. Thus, activating the hMNS facilitates learning about movements, and stimulating the hMNS by means of gesture-based interventions seems to be an adequate instructional strategy to enhance learning with dynamic visualizations for low-spatial-ability learners.

Evaluation of Multiple Sources: Effects of Prior Attitudes and Epistemic Beliefs

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Aim of this study was to examine how prior attitudes and epistemic beliefs influence the evaluation of conflicting information from multiple sources. Twenty-three Dutch 11th grade students participated in a think-aloud study. Participants were selected based on their prior attitudes towards the human influence on global warming and their epistemic beliefs (multiplist or evaluativist). Participants were presented with 16 short texts presenting conflicting information on global warming from sources differing in trustworthiness (high or low). The task was to find an answer to the question: Are humans responsible for climate change? Results showed that participants had no trouble with identifying the conflicting nature of the information, but generally did poorly on source evaluation. There were difference in the evaluation behaviour of students holding evaluativist beliefs and those holding multiplist beliefs. Evaluativist students compared and evaluated information from multiple sources, and were also more likely to assess expertise of the sources, albeit not always successfully. Yet, evaluativists did seem to experience more doubts when confronted with the conflicting information and also reported that they sought to achieve an accurate overview of the
topic, whereas multiplists approached the task by more explicitly linking the information to their own views.

School Leadership and Teacher Professional Learning: Facing the challenges of Sustainable Learning

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Purpose: ‘Learning to learn’ is an important element of educational reform in the 21st century around the globe and in Hong Kong, where students are promoted to have sustainable learning and become life-long learners. The aim of the study is to examine changes in curriculum reform at classroom, teacher and school levels and investigate in-depth the strategies and experiences of these school with effective practices in school-based curriculum in promoting sustainable learning.

Methodology: This research employed the collective case study approach. Two case studies were conducted in two primary schools using multiple sources, a questionnaire survey, individual and focus group interviews, and school documents, to understand how the learning of school in students, teachers, and school management levels have changed in 5 years’ time to promote ‘Learning to learn’.

Result: Triangulated data revealed that significant improvements in innovative praxis in teaching and assessment, continuous teacher professional learning as well as effective school leadership and management were important contributors to move the students into sustainable learning. Significance: There continues to be a demand for well-prepared educational leaders to promote sustainable learning. The study of school leadership analyzed can be formulated as a workable template for meet the challenges of sustaining life-long learning in schools of long history in Hong Kong and elsewhere. Future comparative studies addressing the strategies and impact of the curriculum leaders on classroom level, professional learning level and school management practices level will enrich the field of professional development.

Exploring conceptions of vocational learning and teaching across school and workplace

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Integrating school-based and work-based vocational learning constitutes an important but challenging task for each VET system. Although various integrative teaching and learning models have been developed and several reforms have been launched, their implementation is made complex by several factors. In particular, literature highlights that an important factor that may foster or hinder successful implementation lays in the way how involved parties perceive the issue at hand, since these perceptions influence not only how people process and interpret information but also how they subsequently communicate and act. Starting from these considerations, this study aims to explore different ways of conceptualizing vocational learning across learning sites in the Swiss VET system. Twenty-six semi-structured interviews on vocational learning across learning sites were conducted with vocational school teachers, company trainers and apprentices, involved in apprenticeship programs in Switzerland. Categorical data analysis was applied in order to identify different types of perceived roles and functions assumed by each learning site, as well as different types of perceived reciprocal interactions between learning sites. Reciprocal combinations of those categories were then analysed in order to define clusters of different conceptions of vocational learning and teaching across school and workplace. Preliminary findings show three ways of
conceptualizing vocational learning across learning sites: alternation, school-centred integration, mediation through intercompany centres. Each of them implies different ways of perceiving and realizing vocational learning and teaching across learning sites, pointing out specific potentialities and criticisms for the implementation of integrative teaching and learning models.

**R&D-projects in schools: opportunities for cross-professional collaboration**

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Cross-professional collaboration between practitioners and researchers occurs in research and development (R&D) projects in secondary schools. This study presents an analysis of this collaboration in relation to the research question: What is the nature of the cross-professional collaboration between teachers, school leaders and educational researchers in R&D projects in terms of reasons for collaboration, division of tasks, and communication? Data were collected in interviews with participants from twelve projects and from additional documents. The results show that various parties involved can have the same reasons for collaboration, but that the educational researchers may also have additional objectives. In the division of tasks it is important who directs and guides the research and development and which research tasks each participant tackles. The communication is related to the participants’ backgrounds; mutual communication is important. On the basis of the results, four types of collaboration are distinguished that show differences in the extent to which the school practitioners and the researchers direct and guide the research.

**What is pedagogical change agency in higher education?**

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The aim of this study is to investigate how university academics define and understand pedagogical change agency. Pedagogical transformations are typically explored in the context of pedagogical training programs targeted towards educating more pedagogically aware individuals. In this study, ways of promoting pedagogical development are explored on a communal level through change agency: acting as a broker between the academic and pedagogical communities of practice in order to establish new mutually shared pedagogical concepts and practices. 13 university teachers were asked to describe change agency before participating to pedagogical change agency program in
Spring 2011. The descriptions were compared to Wenger’s (1998) model of brokering and categorized with content analysis. The findings suggest that pedagogical change agency can be realized through practices, such as making changes, developing holistic systems, creating boundary practices, and translation, coordination and alignment between perspectives. When realized through negotiation of meaning, change agency included sharing information, promoting dialogue, reinterpreting meaning, motivating for development, and leading by example. Modes of belonging to a community of practice were described as multimembership, creating a shared repertoire, engagement, and imagination. Identities of a change agent consisted of development motivation, non-participation, and expertise. The results imply that change agency can be understood according to the model of brokering. When promoting pedagogical transformations in higher education, recognizing brokering between various communities of practice as a valuable source of development and providing support for the ways of acting as a change agent presented in this study become critical.

Learning Experiences and Resources in Youths’ Networks: Ethno-Cultural Comparisons

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Social relations are essential for personal development, our understanding of the world and our place in it. In this study we emphasize the function of these relations in youths’ networks as resources of information, knowledge and as links to other resources. We take into account changing means for social connectedness, and study the personal networks of youth consisting of both online and face-to-face relations. We asked how these networks shape learning experiences of –, and function as a resource for Turkish, Moroccan and Dutch youths in the Netherlands. Based on ego-network research methods we conducted 79 semi-structured network interviews with youths aged 12-18. This enabled us to compare structural and compositional features of youths’ networks (quantitative observations), and provided us with in-depth information about learning experiences in the networks from youths’ perspectives (qualitative observations). Our theoretical framework is composed of three related approaches: socio-cultural and networked theories of learning, and learning biographies. Our preliminary results show that there is strong ethnic coherence in networks and this coherence is reflected in most youths learning experiences. Furthermore, online platforms have multiple functions as learning sites and as catalysts of social relationships.

Informal Learning with the Internet – how students use the Internet for study related exchange?

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The Internet allows to communicate and to collaborate in various ways. An open question is, however, whether young people, especially students, use the Internet for learning or more precisely for an informal exchange of information in terms of either general learning or specific exam preparation? To examine young peoples study related usage of the Internet we conducted a web-based survey (N=150) asking for their general online learning and exchange behavior. We found that one third of the online time in online networks is used in order to discuss learning related issues. In general, the amount of online learning exchange behavior can be predicted by the emergence of a social space with other students and the satisfaction with others students activity.

Impact of Instructional Design on Collaborative Mobile Learning

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This paper examines the impact of instructional design on the collaborative learning process at a mobile learning trail; specifically we are interested to find out how the three critical design components, activity design, technology-mediated tools and facilitation shape the collaborative learning trajectory in an outdoor environment. Our paper focuses on an integrated humanities learning trail with two secondary one classes in one of the future schools in Singapore. Trail structure and activity design models an inquiry-based mobile learning which sees a rich integration of Geography and History skills, knowledge and concepts. Quantitative and qualitative data afforded an insight into students’ perception of collaborative mobile learning, as well as, the collaborative work process. Surveys and interview findings showed that students appreciated the authentic learning platform, leveraging on the affordances of the physical environment and the mobile technologies. The provision of feedback and comments in the web-based platform also enhanced the immediacy of facilitation, which guided them in the collective review and re-negotiation of shared understanding in the meaning-making process. Overall, findings show that promoting effective collaborative mobile learning is contingent not only on the lesson design, but also, on a dispositional shift towards collective cognition and the socio-cultural practices of the collaborating community. In conclusion, we will discuss some key implications of the instructional design on the mobile learning context for collaborative inquiry learning and the inter-relatedness of the three key components (activity design, technology and facilitation).

Argumentative Knowledge Construction in Facebook: Raising Expectations and Argument Support

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Learning in Facebook may be particularly suited to facilitate online learners’ social awareness, i.e. help them consider the audience and the social processes involved in such a context. Moreover, Facebook can be used as a platform for argumentative knowledge construction, especially when this additionally scaffolded. In a control group study, we investigate the effects of raising expectations for sharing arguments and of argument construction support during individual preparation, as well as their interaction, on domain and argumentative knowledge. Our results reveal that raising expectations about upcoming group processes can be counter-productive for learning in social networks. Support for structuring the argumentation in Facebook can remedy possible negative effects of expectations about group-processes.

**Talking ideas into being: Reasoning about science phenomena in the elementary classroom**

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The paper emphasises processes of growing understanding and reasoning about scientific phenomena in open inquiry activities. It highlights the interplay of multiple cultural resources, which 4 to 8 year old children from diverse sociocultural backgrounds draw upon, to create shared meaning and attention when ‘doing science’ in classroom contexts. The rationale is to deepen our understanding about the nature of learning from a dialectical perspective, i.e. how processes of personal inquiry and collective knowledge creation mutually develop. ‘Doing science’ as cultural enactment unfolds through a non-linear and creative combination of culturally given tools and children’s specific multimodal repertoires. The research draws close attention on the context-sensitive organization of these processes. The study is supported by a multi-method framework allowing to embrace multiple perspectives on the children’s inquiry processes. Two excerpts are discussed in detail, one from kindergarten and one from 2d grade, which address the children’s inquiry processes in different ways, but reveal an astonishing depth of scientific reasoning of children at this age.

**Creative Inquiry with ipads and cloud learning in elementary science**

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The present paper emphasises results of an ongoing research project (2012 -2015) about creative inquiry with mobile technologies in elementary science education. The analytical lens is directed towards the situated ways in which 8 to 12 year old students (n=300) make sense of science phenomena through creative inquiry practices. The project is supplying classes with ipads and a secure internal cloud service. These devices are equipped with a range of sensors, which allow students to capture, collect, treat and visualise a broad range of data. Applications permit to combine these collaborative inquiry data with content from print or digital media sources. The internal cloud facilitates to comfortably share all kind of data between students and teachers and to
disseminate final productions to a private or public audience. The study explores how mobile devices facilitate the understanding of scientific phenomena and the formation of scientific thinking. A core concern deals with processes of creativity, critical thinking, communication and collaboration as emphasized by the 21st century skill frameworks. To achieve this goal, classroom activities are recorded through video data once per trimester and for two consecutive school years. The research analyses also how the students’ productions come into being by considering the versions students store on the internal cloud server. Moreover, the ipads allow students to record themselves their learning and comment on their inquiry approaches.

**Increasing interaction by offering variable manipulation possibilities in inquiry learning**

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An important feature that distinguishes inquiry learning from other approaches is involving learners in active knowledge construction. Active Involvement, e.g. by manipulating variables, is assumed to lead to deeper processing. Manipulating variables may help especially for acquiring intuitive knowledge. Yet, it also may lead to increased mental effort. Students (N=118) from four chemistry classes conducted simulation-based scientific experiments using Molecular Workbench (Xie & Tinker, 2006). The level of variable manipulation during experimentation was varied across conditions: (1) Manipulation Group and (2) No-Manipulation Group. A group was added to assess the value of preparing students for experimentation: (3) Preparing-Manipulation Group. Results indicate that students of the Manipulation Group outperformed students of the No-Manipulation Group with respect to intuitive knowledge (d=1.14). Descriptive results indicated higher mental effort in the Manipulation Group than in the No-Manipulation Group. But this difference was not significant. Unexpectedly, students in the Preparing-Manipulation Group did not profit from preparation in contrast to the Manipulation Group (intuitive knowledge: p=.413), but still outperformed the No-Manipulation Group (intuitive knowledge: d=1.55). Results indicate a slightly higher mental effort in the Preparing-Manipulation Group, but this difference was not significant. Findings suggest that variable manipulation during experimentation leads to higher intuitive knowledge. Furthermore, findings are in line with the notion of desirable difficulty (Bjork & Linn, 2006): Indeed, it seemed that the Manipulation Group benefited from additional effort spent during experimentation in contrast to the No-Manipulation Group. However, preparing students for experimentation was not effective.

**Review of Inquiry-Based Science Learning Studies Based on the DOLA Framework**

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This review study is an exploratory look at the classification of experimental inquiry studies based on the differentiated overt learning activities (DOLA) framework. We reviewed 24 experimental inquiry studies (with two or more conditions) to: 1) Investigate relative effectiveness of inquiry conditions on students’ learning compare to control conditions used in those studies; 2) clarify and explain the
discrepant findings in some highly cited experimental inquiry studies. The framework provided a good model to comprehend and interpret the results in inquiry based science education literature. The classification of overt activities and /or interventions based on underlying cognitive principles offered a finer grain size to analyze and understand the contradictory findings in different studies as well.

The Evaluation of Surf-Fair, a Constructivist Cyberbullying Prevention Program

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Because cyberbullying is a prevalent problem with negative consequences for today’s youth effective prevention programs are needed. The constructivist cyber-specific prevention program Surf-Fair was developed; suitable for 5-7th grade classrooms and their teachers this program teaches critical media literacy by means of a fictitious video-based case and multiple exercises focusing on perspective taking and empathy for the different roles relevant to cyberbullying, namely cyber-targets/victims, cyber-perpetrators/bullies, and different kinds of bystanders. Surf-Fair was evaluated in two case studies. Study I has a pre-post-follow-up design with three 6th grade classrooms (N = 87; control group, short and long treatment groups). Study II is a field study with a pre-follow-up design with twelve 5th grade classrooms (N = 289) that were trained by university students or regular teachers. Results indicate that Surf-Fair can significantly reduce (Study I) or buffer the natural increase of (Study II) negative cyber incidents. These effects transfer to negative offline incidents (Study I). Surf-Fair also significantly increases students’ propensity of using adequate technical coping strategies (Study I and II), is consistently evaluated positively (Study I and II), and can be successfully administered by regular teachers (Study II). Thus, Surf-Fair offers a promising avenue for the future prevention of cyberbullying. Theoretically, these studies imply that cyberbullying has unique cyber-specific characteristics that can be used for prevention and intervention. Practically, it shows that regular teachers can successfully administer prevention programs and that schools should make evidence-based decisions about the implementation of effective programs for prevention and intervention.

International Online Reciprocal Peer Tutoring for the improvement of linguistic abilities in Spanish

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This paper reports an on-line reciprocal peer tutoring project for improving language competence in Spanish and English. Students aged 9-12 years from Scotland and Catalonia were paired to act as tutors in their own language and as tutees in a modern foreign language. Students were intended to improve both, their first language (through helping the tutee) and a foreign language (with their tutor’s help). The methodology combined a quasi-experimental design and a qualitative analysis of texts. For Catalan students, pre-post test results indicated statistically significant improvements in reading comprehension (while acting as tutors) and writing (while acting as tutees). Scottish students improved only their writing (acting as tutees). Analysis of the texts showed that when more support was given, the tutor had more learning opportunities, but then there were fewer opportunities for the tutee, and vice versa. Thus the tutee learned more with less elaborated feedback, leading to fewer opportunities for tutor improvement. This paradox could be resolved by adjusting the scaffolding support given by tutors, to create a balanced interactive learning context for both members of the pair.

A small village school as a peer-learning environment

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This study focuses on the peer learning environment in small schools and asks which types of peer learning processes occur in multi-grade teaching and multi-age groups in small schools? By answering this, the study aims to add our understanding, which advantages and challenges does pedagogy in small schools have for education from the point of view of peer learning. As empirical data has been used narrative teacher interviews (n=9), pupils’ writings (n=66), group interviews of pupils (n=8), and teaching observations that have been collected in two small Finnish primary schools (Grades 1 to 6, children aged between seven to twelve) during 2010-2012. Using content analysis and narrative analysis (Riessman 2008), the following types of peer learning processes have been analysed in the data: peer tutoring (students teach other students), cooperative learning (students work together in a group) and collaborative learning (knowledge is socially constructed between or among students) (see also Parr & Townsend 2002). The analysis is deepened by Vygotsky’s (2002) socio-cultural learning theory and Bruner’s (1996) ideas of narrative learning and a collaborative culture of school. According to preliminary research results, peer tutoring occur spontaneously at classroom but teachers can use peer tutoring also as an intentional teaching strategy. The places outside classrooms can be seen a significant ‘medium for community’ (Bruner 2006, 182) and important places of collaborative learning. Further research task is suggested to study special characteristics of pedagogy in small schools that may foster collaborative learning.

Children’s perceptions of antisocial motives in peer interaction

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Abstract Previous research has shown that children with impaired social skills may become involved in repetitive cycles of maladaptive behavior, and may thus become increasingly isolated from their peers. As a result of this, children who would stand to benefit from healthy social interaction with peers are in fact those who are excluded from such interaction. In order to establish effective intervention strategies which may address the escalation of such antisocial behavior, it is necessary first to understand the motives which lie behind children’s antisocial behavior. The current empirical study, conducted in Scotland in 2012, involved the participation of 112 children in the age groups 7-8 years and 11-12 years. Children were asked to speculate on the motives of cartoon characters depicted in peer-directed antisocial behaviours. When the children’s responses had been recorded on confidential questionnaires, quantitative data analysis was undertaken using SPSS statistical software. Although tentative, initial preliminary findings suggest that the children appeared to consider that the antisocial behaviours of the cartoon characters were related to a wish to inflict hurt, rather than to fit in with conventional group behaviours, or to gain some personal social reward, such as popularity within the group. Such findings may have implications for the design of intervention strategies designed to address levels of peer-directed antisocial behavior among children.

Learning approaches, self-regulation, reading comprehension and science achievement: a path analysis

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... academic achievement in science (Title). The aim of this study was to gain a better understanding of the interrelationships between students’ reading comprehension and science achievement and to investigate how these variables are linked to students’ learning approaches and strategic self-regulation. A standardised comprehension test and two questionnaires that assessed learning approaches and strategic-self-regulation were administered to 606 ninth-grade students selected from sixteen schools (state and private). Hierarchical regression and relative weights analyses revealed two main findings. First, an active engagement in science classes, as evidenced by generating high-level questions and minimising surface learning was related to better reading comprehension; learning in a surface way, however, showed greater relative importance. Second, although academic achievement in science was significantly predicted by students’ reading comprehension and by their use of self-regulated strategies and adoption of surface learning approaches when the other predictors were statistically controlled, it is fundamental to note that reading comprehension showed the highest relative importance and therefore seemed to be the ‘keystone’. To the best of our knowledge, this is the first time that a) these predictors of academic achievement have been analysed together and b) a measure of the relative importance of each has been provided. Implications of the results for policy-makers and practitioners are discussed.
Just what is engagement? Untangling and defining the concept

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As a lay term, engagement is well understood. As responsible educators we aim to create environments that facilitate students’ engagement with the material and their sustainable development into lifelong learners. In the educational literature, however, engagement has been poorly conceptualised and defined. Theoretical work has typically considered engagement to be multi-dimensional, including cognitive, emotional (affective) and behavioural components (e.g., Fredricks et al., 2004; Kahn, 1990). However, while a number of approaches have been taken, no consensus exists on how engagement, or its dimensions, should be properly measured or distinguished from related constructs. At the tertiary level, understandings of student engagement are not well developed, and have been primarily limited to students’ behavioural involvement in a range of educational activities (Kuh et al., 2005). This limited conceptualisation is unfortunate, as our current university-level learning contexts are not hugely, or even characteristically, engaging (Wesch, 2012; Tinto, 2009). When combined with the messy definition and measurement of engagement more generally, it leaves us ill-equipped to understand or intervene to improve tertiary-level learning contexts. This paper constitutes an initial attempt to address this gap. It will draw on organisational and social psychological literature to present a framework for understanding engagement. In particular, it will introduce Fleck and Inceoglu’s (2010) cognitive-affective model of work engagement, which suggests that engagement comprises four facets: absorption, energy, alignment, and identification. These facets will be discussed with reference to educational engagement, and used to differentiate engagement from other major constructs that border on, and compete for, engagement’s conceptual space.

Student Learning in High School: Extending the 3P Model

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Biggs’ (1993) 3P (Presage-Process-Product) model provides a framework for understanding relations between students’ perceptions of the teaching environment, the learning strategies they use, and their learning outcomes. However, relatively few tests of the model in secondary education contexts have been conducted, and even fewer have used longitudinal rather than cross-sectional data.
collection to control for effects of prior variance. Using structural modeling, we tested an expanded 3P model in the Australian secondary education context, using data from 2002 high school students across 12 schools. Holding constant the effects of a broad range of covariates (e.g. age, gender, non-English speaking background, parental education, prior achievement, and Big Five personality factors), we found direct and indirect effects of two Presage variables, academic self-efficacy and perceived teaching support, across a range of range of desirable proximal (classroom participation, homework completion, school satisfaction) or distal (educational aspirations) Product variables. Supplementary analyses focusing on indirect effects also support Biggs’ arguments for metalearning processes, where relations between Presage and Product variables are in part mediated by Process learning strategy variables. Over and above memorisation and elaboration learning strategies, our model identified a role for Personal Best goals for generating metalearning. The results of the present study add substantially to the evidence base for the 3P model in secondary education settings, and provide guidance for educators seeking to predict the likely effects of interventions focusing on academic self-efficacy and perceived teaching support.

**Do Testing Effects Change Over Time? Insights from Immediate and Delayed Retrieval Speed**

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Beneficial effects of retrieval practice on long-term memory performance are well documented in the literature and have potentially substantial implications for educational practice aimed at sustained learning (for an overview, see Roediger HL, Butler AC (2011). Trends in Cognitive Sciences 15:20-27). However, these so-called testing effects often only become visible over time. In contrast, the present study documented testing effects on response times both immediately after practice and after a delay. Forty participants learned the translation of 100 Swahili words and then further restudied the words with translations or retrieved the translations from memory during testing. As in previous experiments, recall success was higher for restudied words than for tested words immediately after practice, but higher for tested words after seven days. Response times for correct answers, however, showed a different result: Learners were faster to recall tested words than restudied words both immediately after practice and after seven days. These results are interpreted in light of recent suggestions that testing leads to a restriction of the search set activated during later retrieval to relevant target information. An additional outcome was that testing effects on later recall were related to perceived retrieval success during practice. When several practice retrievals were successful, testing effects on recall success were significant already immediately after practice. Together with the reaction time data, this supports recent models that attribute changes in testing effects over time to limited item retrievability during practice.

**Making sense of contradictions: Regulation Episodes in Ph.D. students’ writing their first research**
From a socially situated perspective on writing regulation, this study aimed at gaining a deeper understanding of how Ph.D. students regulate their academic writing activity while writing their first research article. The final aim of this study was to analyze how writing regulation takes place within the framework of an educational intervention designed to help Ph.D. students successfully overcome the contradictions involved in the process of constructing their social identity as researchers and academic writers. We collected data from Ph.D. students’ perceptions (discourse in interviews, diaries, in-class interaction) and practices (successive drafts, peer’s text revisions) when participating in a seminar aimed at helping them write their first research paper. Unit of analysis was the Regulation Episode, defined as the sequences of discourse and/or action from which a contradiction may be inferred and which, in turn, lead to the implementation of innovative actions to solve it. Results showed that contradictions regarding text conceptualization and writing identity become visible through certain discursive manifestations such as dilemmas and critical conflicts. Dilemmas were more difficult to solve than the rest of discursive manifestations and they mostly appear in regulation episodes regarding writing identity. Redefining the output and considering text as a tool to think are successful ways to solve contradictions and regulate student’s writing activity which result in substantial changes in drafts. The development of students’ scientific writing identity is affected for their perception of a peripheral participation into the scientific community. Educational implications for helping students’ scientific writing development will be discussed.

Mentoring and nurturing undergraduate researchers: a cross-disciplinary perspective

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There is a general consensus that research skills and researcher development should take place at undergraduate level, and that such skills are an important element of the knowledge economy. This idea is also evident in debates connecting research and teaching. As Australian universities prepare for further growth in research there is growing reference to the need to develop researchers in better ways at the beginning of Higher Degree Research. The focus of this paper is the mentoring of potential researchers at undergraduate level, particularly fostering students with research interests and capabilities and providing them with an opportunity to engage in a research project. For this
study, coordinators of fourth year undergraduate research projects in 19 different disciplines within one Australian university were interviewed. The role of coordinators as stewards of the discipline emerged as a strong theme, with these senior staff members acting as gatekeepers and nurturing potential researchers within their discipline. The results of this study are discussed in this paper in relation to the global interest in providing an effective transition for beginner researchers within a scholarly community of practice.

The interplay between staff understandings of assessment and their assessment practices in HE

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The aim of the study reported in this paper was to investigate how higher education staff understand assessment and the relationship between these understandings and their assessment practices. This was approached by using dialogic concept mapping (Hay, 2008). Nine members of staff from two UK universities participated in a workshop during which they constructed a concept map about assessment that was discussed in a one-to-one semi-structured interview. Multiple opportunities were given to revise the map, complemented by the discussion of ‘assessment artefacts’ which were integrated into the maps as examples. This approach enabled different representations of understanding and practice and was a vehicle for exploring the interplay between the two. A two-way relationship emerged, whereby understanding shaped practices, but practices also appeared to shape understanding. However, making clear distinctions between thinking and practising sometimes proved difficult since they were closely interlinked. In addition, the data highlighted tensions which seemed to echo what Boud (2000) refers to as the ‘double duty’ of assessment and the multiple and often contradictory influences upon staff understandings of assessment and their assessment practices. Overall the study demonstrated the potential of the approach used, in particular of dialogic concept mapping, and the benefits as well as the complexity of research in this area which is not exclusively interview based.

On the acceptance of software-generated evaluations of students’ written assignments

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If instructors are faced with large courses, giving regular feedback to every student might be an unmanageable effort. Software-generated feedback could alleviate this task (e.g., a tool based on Latent Semantic Analysis (LSA)). In a previous study, we had shown that software-generated evaluations of students’ written assignments agreed strongly with human evaluations by tutors (Seifried, Lenhard, Baier & Spinath, in press). Nevertheless, software-generated evaluations might be
less accepted by students. The present study employed an experimental design to investigate the acceptance of software-generated evaluations. Students were randomly assigned to four groups that differed with respect to a) whether the feedback came from a tutor or a software tool and b) whether students were told that the feedback came from a tutor or a software tool. Within a regular lecture, N = 300 pre-service teachers submitted assignments, received feedback on their submission and completed a survey. Results showed that students differed with regard to the perceptions of their feedback depending on the assumed source of feedback (more positive for the assumed tutors' feedbacks). However, results differed with respect to more general items about the use of computers. Further, there was no negative effect on students’ motivation, their perceived knowledge or their aspiration level. Because there are no negative effects on these important learning-related variables, the use of automatically generated evaluations should be considered as a possibility to assist human evaluators.

Supporting self-monitoring via graphical visualizations improves learning in higher education

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Self-monitoring provides self-regulated learners with data about their own learning processes. Discrepancies between these data and one’s personal standards can induce a reactivity effect which is a central process for the improvement of one’s learning behaviour. One important problem in higher education is students’ postponing of important learning tasks that inhibits positive learning outcomes. Against this background, the scope of our research was to investigate whether a web-based visualization tool that mirrors students their self-reported dilatory behaviour can induce self-reactivity effect and thereby support self-regulated learning. Theoretically, potential advantages of such visualization might be traced back to a non-specific signalling effect and, additionally, to the specific informational feedback provided by the visualized data. The thus induced reactivity effect should reduce the learners’ dilatory behaviour and improve self-regulated learning. To test these assumptions, we conducted a field-experiment in medical studies. We contrasted three different experimental conditions: a visualization condition in which students were mirrored their authentic self-reported dilatory behaviour (veridical visualization), a visualization condition in which students were presented random data (random visualization), and finally a condition without visualization.
Results indicated that students with a random and a veridical visualization of their dilatory behaviour were more likely to engage in metacognitive and cognitive strategy use, but those who received veridical informational feedback on their past dilatory behaviour most effectively reduced their dilatory behaviour over time. Together, these results are suggestive of ways in which students in higher education can be supported in regulating their learning behaviour more effectively.

**A latent growth curve analysis of Business students’ intrinsic and extrinsic motivation**

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The proposed paper aims to investigate the longitudinal development of students’ motivation over the first year of their studies at a business school by using latent growth curve modeling. The study tackles the following core research questions: How do first-year university students’ intrinsic and extrinsic vary over time? Which (motivational) factors are related to students’ motivational development? Although motivational dispositions have been analyzed extensively in previous studies, their longitudinal development has hitherto not been examined in the higher education context. This longitudinal study is conducted at the University of St. Gallen in Switzerland. The current sample includes 280 first-year students who have been surveyed three times and who are representative of the first-year student population. Descriptive results show that prior to their studies, students were motivated most by intrinsic factors, however, extrinsic motivation was also quite high. Employing latent growth curve modeling, it could be shown that both intrinsic and extrinsic motivation decline significantly over the course of the first year (8 months). The study contributes to motivation theory by providing further insights into the development of academic motivation over time. Latent growth curve modeling as a method can be well used for longitudinal data analysis, thus, excluding measurement error from longitudinal data. Furthermore, the study supports educational developers by determining factors influencing students’ motivational development.

**How experts maintain performance in novel situations: A review of adaptive expertise**

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Flexibility at the workplace is a key ingredient for professional success. However traditional expertise models do not take this flexibility into account, but perceive expertise as stable once achieved. This is also apparent in the educational system which focuses on teaching content, thus creating experts in one field, instead of providing graduates with the necessary competencies to create a successful career. Higher educational institutes need to pay more attention towards the fact that changes in tasks, context and methods can have a dramatic impact on the performance level and career of their graduates. The concept of adaptive expertise is suggested as accurately describing the difference between people who can easily deal with changes in the work environment and those who require considerable time to adapt to the new situation. A systematic literature review is conducted to
provide a description of how adaptive expertise develops based on proven predictors. The review indicates that a distinctive characteristic of adaptive experts is their ability to use deep/abstract level of reasoning. Support also exists in the literature that a work climate which favors learning over performance and which allows mistakes to be made fosters the development of adaptive expertise.

**Using stimulated recall for the investigation of self-regulated learning**

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The paper examines the possibilities of using stimulated recall as a method for research about self-regulation in inquiry-based science learning. Twenty teams of students from grade 4 to 6 (mean age 11.2 years) were videotaped while working on an experiment in the context of natural sciences. 10 teams worked with structured inquiry (and were given a description of how to proceed) and 10 teams worked with guided inquiry (where students devise their own procedures). Immediately after working on the task, students were shown extracts of the video and interviewed about the regulation of their learning process. The questions for this stimulated recall were formulated according to Pintrich’s conceptual framework (Pintrich, 2004). The data from the stimulated recall was coded using a scheme developed to capture students’ reflections on the content as well as the depth of cognitive processing. In addition, the questions used by the researcher were coded as well. Results show, that while there was no difference in the way students were prompted by the researcher there was a difference between the two conditions (structured versus guided inquiry) with regard to the depth of students responses: Students who had previously worked with guided inquiry gave more high-level responses than those who had worked with structured inquiry. The findings are discussed in terms of their relevance for self-regulation in inquiry based learning as well as methodological implications.

**The prompt-effect: Coherence types of prompts and learning outcome**

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Learning diaries with prompts (N&xf;ckles, H&xf;bner, Glogger, Holz&xe;xb4;pfel, Schwonke & Renkl, 2010) support deep learning. Prompts are specific instructions to reflect on a learning challenge and increase quantity and quality of learning outcome (Biggs & Collis, 1982). The present study tested the effects of prompts in learning diaries on self-regulation (Pintrich, 2003; Zimmerman, 2000). N=202 students were assigned to three groups: 2 experimental and 1 control group over 14 weeks. In experimental group 1, prompts were rich in content, in experimental group 2, the prompts were unrelated to the content (Berthold, N&xf;ckles, & Renkl, 2007). The control group received regular instruction. The experimental groups turned in a reflective text (2 pages) on their reading each week. The quality of the texts was assessed using the SOLO - Structure of Observed Learning Outcomes taxonomy (Biggs & Collis, 1982), which distinguishes five categories of learning outcome in terms of text complexity. Quantity of learning was measured by a knowledge test. Moreover, interest (Vollmeyer, Rheinberg, & Burns, 2001) and negative mood (Dalbert, 2009) were measured. Results demonstrate a clear advantage of prompts over no prompts with regard to quality and quantity of learning outcome. For depth of learning, the presentation of content-related prompts was more effective than that of prompts unrelated to the content. Moreover, at the end of
the experiment, the level of negative mood was significantly higher in the control group compared to both experimental groups. Results are discussed in the light of stimulating self-regulation processes by prompting cognitive activity.

**Self-regulated learning in the museum: Visitors’ goals, learning strategies and appraisals**

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Self-regulated learning (SRL) refers to the modulation of cognitive, affective, and behaviour processes oriented by goals (Sitzmann & Ely, 2011). The relationship between learning strategies and motivational variables was extensively researched in school settings (e.g., Berger & Karabenick, 2010), however, to a lesser extent in informal settings. In an informal setting without competitive assessment, SRL processes might have a stronger effect on learning (Sitzmann & Ely, 2011) and differ from that in school settings (Boekaerts & Minnaert, 1999). To date, little is known about SRL in informal contexts, such as in a museum. To investigate SRL in the museum, more specifically visitors’ goals, their intended learning strategies, actual learning strategies, and learning appraisal, two studies were conducted. Results showed visitors with different goals or goal patterns have according intended strategies; different actual learning strategies can predict different appraisals. Specifically speaking, mastery-approach and performance-avoidance goals can predict intended deep learning strategies while goal cluster identity can predict surface learning strategies; actual surface learning strategies can predict control beliefs and test anxiety while deep learning strategies can predict self-efficacy. Several implications such as the multiple tracks of SRL, different roles of control beliefs and self-efficacy, and other similarities and differences of learning motivation between informal and school learning settings could be discussed.

**Cognitive Load while Using Learning Strategies**

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In the last years the importance of self-regulated learning processes increased steadily (for an overview see e.g. Artelt & Moschner, 2005) One of the central key competencies of successful learning is an efficient use of learning strategies. This study aims to investigate, whether learning strategies can optimize learners cognitive load, i.e. improve mental effort and reduce disturbing effects. In a regression study we asked 118 5th grade students to assess their self-estimated overall use of cognitive, metacognitive and motivational learning strategies after a strategy training. Furthermore they had to rate their perceived cognitive load in retrospective. The relationship
between the use of cognitive strategies and cognitive load has also been analyzed by using concrete learning tasks. Our findings show, that all three kinds of learning strategies had a great and optimizing impact on students cognitive load. Cognitive learning strategies reduce disturbing effects, whereas metacognitive as well as motivational strategies lead to a higher invested effort. Future research should investigate how to assess metacognitive and motivational strategies during an actual learning task. Therefore we need reliable methods of introspection or process data.

Retrieval Practice is Better than Restudying and Elaborative Restudying in Vocabulary Learning

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The testing effect is the phenomenon that retrieval practice after a study session enhances retention more than restudying the course material. We examined the effect of retrieval practice in primary school vocabulary learning. Third grade children studied word definitions and then did exercises according to three learning conditions; restudy, elaboration or retrieval practice. Children in the restudy condition reread the definition and copied a part of the definition. Children in the elaboration condition reread the definition and did exercises with semantically related words. Children in the retrieval practice condition recalled the word based on its definition. On a final retention test after one week the children in the retrieval practice condition outperformed the children in the other conditions. These results suggest that retrieval practice is more effective for primary school vocabulary learning than restudying and elaboration.

Fostering Second Language Acquisition in Primary-Schools – Implementation and Evaluation

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This study reports the evaluation of the first year of a second language training program for primary-school children of immigrated parents. The program is based on current second language acquisition theory and research, and concentrates on structured language input in authentic communication settings. A mixed-method longitudinal design was used to address two research questions: How can a theory-based second language training program put into practice successfully (formative evaluation)? Can second language acquisition be fostered effectively with the examined training program (summative evaluation)? Results suggest that the theory-based training program can be an appropriate measure to foster the second language acquisition of the target group effectively, if implemented as conceptualized. Concluding, lessons learned from the evaluation of a long-term oriented second language training program in the complex context of a school project in a deprived urban area are reported.

Revisions in L1 and FL Writing

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During the last decades, English has taken over the role of the academic lingua franca. Although this allows the enormous advantage of international exchange, it poses extra demands on FL writers. Studies have shown that successful FL academic writing requires, among other things, the ability to adapt writing strategies to the different conditions. One key-element in this aspect is revision. In a study, it was analysed how and what students revise in L1 and FL. The results show that the participants did not change their strategies in a relevant way, which led to texts which contain a high number of errors which are L1 induced and make the understanding difficult to L1 readers of the FL. It is thus essential to teach and train revision in writing pedagogy.

On a conceptualization of doing second language learning as a social action in itself

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A growing body of studies on learning using Conversation Analysis (CA) argues that CA’s participant orientated analysis of social interaction can help to better understand how learning in interaction is done. Currently there are three main approaches to learning within CA: studies arguing for a link between social interaction and learning, studies on longitudinal change in structural-sequential phenomena in interaction and studies on learning as a social action in itself. Most CA-studies on language learning are positioned in the first and second approaches. This paper is positioned in the third approach and examines a video recorded situation of the social interaction of a 7-year-old girl and the instructor at a language immersion program. They are engaged in working with and solving a task (which fruit is red) in the girl’s second language, Finnish. We aim to show that it is possible to find empirical support for understanding second language learning as something that people explicitly do in the first instance. Focus will be on aspects of relevance to the analysis of doing
learning and more precisely on the girl’s epistemic positioning and its change over the course of the 8-minute long situation. In the analysis we have found that the girl’s epistemic positioning changes from her looking for an answer and claiming that no answer can be found to her explicitly topicalizing that she does not know the answer to her finding the correct answer.

The Effects of language and reading methodologies on Children’s Development in Spanish

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gu53ti 12.00 Spanish is a transparent language, yet beginning readers, most of them being from deprived socio-cultural populations, fail to attain expected levels of decoding. 94 Spanish-speaking children were evaluated in phonological skills crucial for learning to read in kindergarten and followed-up one year after. Children were attending in kindergarten to schools using different pedagogical methodologies: one developing language and literacy skills, and another one following a traditional approach. In first grade the former group also received additional phonological training. Methodologies were matched in age, IQ, reading level, and school characteristics. The results indicated that phonological skills predicted reading with specific patterns related to Spanish. All phonological skills improved from kindergarten to first grade. However, the level of language skills was not sufficiently advanced to support ceiling level at reading performance as it has been found in other studies in Spanish. Children in the sample had on average poor decoding, speed and reading comprehension skills at the end of first grade. No significant differences were found between methodologies nor on the experimental tasks or the standardized reading tests. Although phonological and language skills have been demonstrated to be crucial for learning to read, teacher’s declared lack of knowledge regarding the implementation of the methodology and resistance based on low expectations affected negatively children’s language and reading development. The study reported here provided solid information for future pedagogical intervention. The findings will be discussed in terms of the optimal kindergarten school practices for economically disadvantaged children, as well as responsible teaching and sustainable learning.

Perspective effects on reading of social scientific issues

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Science reading is an important process of science learning. This study aimed to explore how students’ views or perspectives affect their reading behaviors regarding social scientific issues. Specifically, this study examined how students with different perspectives read two news reports of conflicting positions about a controversial issue of nuclear power. An eye-tracking experiment was used to examine the attention allocations while reading the reports. Participants of this study included 43 university and graduate students, including 19 with supportive perspectives and 24 with opposite perspectives, in Taiwan. In the experiment, each participant was asked to read two BBC news reports with conflicting positions concerning the use of nuclear power. At the same time, the eye movement was tracked and recorded by FaceLab and GazeTracker eye-tracking systems. Results of paired t-tests showed that no significant difference was found in overall students’ visual attention between readings of the two reports; however, when dividing students into two groups of perspectives, t-test results showed that students’ perspectives had significant impacts on their visual attention allocations. Specifically, the opposite-perspective students reading an opposite-position report tended to spend and fixate more time on reading than the supportive-perspective students reading a supportive-position report. In sum, this study showed that individuals’ perspectives regarding social scientific issues had an impact on their visual behaviors and this might be related to their information needs, selections and personal beliefs. Future studies can further explore the interrelationships among students’ visual behaviors, personal beliefs, information needs and information selections.

**Analyses for a Better Understanding of Students’ Reading Achievement Along Different Text Formats**

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Extensive research has prevailed in how students’ read, what cognitive and affective variables determine successful decoding and comprehension, what models describe the process the best, and which educational systems seem to be the most efficient in fulfilling students’ potentials in reading. Nevertheless, most studies only scrutinize these aspects in continuous texts and fail to extend the scope of research to non-continuous text formats. This paper aims at (1) comparing students’ development along continuous, mixed and non-continuous text formats; to examine the extent to which (2) different cognitive background variables influence students’ achievement along different text-types and (3) text format determines test construct validity within a longitudinal program. Students performed significantly better on continuous than on non-continuous texts. Students’ reading comprehension improved significantly on the continuous and mixed text between the two assessment points; however, no improvement can be observed in reading non-continuous texts. Results show that mathematical reasoning has more significant effect on understanding continuous text formats, by explaining 10.83-11.11% of the variance of performance, than on non-continuous and mixed text formats (3.93-5.11%). The school-readiness test also has a significantly greater role in understanding continuous texts than their non-continuous or mixed counterparts whereas the inductive reasoning test has no significant effect on students’ achievement. The findings suggest that the measured reading cognitive aspects are related to each other regardless of the text format. Further research is required to identify factors explaining students’ understanding of non-continuous texts to a greater extent as no indication of a dominant cognitive variable was found.

**The importance of self-regulation to deeply comprehend texts**
The general goal of this research was to study the self-regulated reading process and to find out the relation between self-regulated processes and performance in questions measuring different levels of comprehension (more superficial or deeper comprehension). To meet this goal, both online and offline data were collected. The self-regulated reading process followed by 55 secondary school students was examined. Online data consisted in the reading traces obtained by keeping track of the processes using specific software; offline data was collected by asking participants to judge their confidence in the answers. Participants read an expository text, answered comprehension questions and made judgements of confidence afterwards. Four reading processes were identified, differing in terms of self-regulation (from more mechanical to more strategic). Those showing more strategic processes performed significantly better in deep comprehension questions (but not in superficial comprehension). Different indices of calibration were calculated by comparing the judgements of confidence and actual performance. Strategic readers were also those who better calibrated their comprehension, and those who performed better. In line with prior research, participants were not good at calibrating their comprehension, especially for deep comprehension questions. These results emphasize the importance of self-regulation to achieve deep comprehension, and have valuable educational implications, as they provide evidence of the importance of teaching metacognitive strategies to improve students deep processing of texts.

Raising achievement in writing: Focus on enhancing the quality of teaching practice

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Writing performance is of concern internationally; a frequent response is to focus on enhancing the quality of teacher practice. This presentation adopts a wide lens perspective and synthesizes several research studies investigating aspects of a demonstrably successful national Literacy Professional Development Project. The project was an evidence-informed, needs based approach to whole school professional development, scaffolded by a visiting expert facilitator. In schools that participated, primary school students (aged 5 - 13) in writing gained at 2 to 3 times the national average expected rate; the project involved three different cohorts of schools, each of two years, so the results were replicated. Data collected throughout the project cycle included student achievement (in this case, writing) data; student interviews; classroom observations and responses from teachers to scenarios; interviews with teachers and leaders, and taped examples of facilitator practice when giving feedback to teachers and leaders. Drawing on these data, we discuss features of the project demonstrated as contributing to its success, in line with theoretical understandings. These features include the development of expert facilitation skills in coaches; teacher increased understanding of...
diagnostic data and its use to adjust practice to meet student need; teacher enhanced classroom practice and use of ongoing inquiry into practice; the need for coherence within school endeavours, and the fact that learning occurred at all levels of the project with learning at one level influencing what happened at another.

**Different Self-Conceptions & Orientations of Teachers as Change Agents**

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A mostly new field of research has established, focusing on factors that influence the successful transfer of externally developed innovations in educational systems. Following this approach, transfer of innovations is understood as the dissemination of scientifically-based knowledge in educational systems, which basically means the transfer of an externally-developed innovation from a context A to a context B. Transfer research also indicates that there is a key role within the process of transfer, namely change agents who are described as single persons or groups. Although, various researchers define several roles of change agents from a normative perspective there is lack of empirical based knowledge about their self-conception in educational change processes. Therefore, the main objective of our study is to enrich the empirically-based body of knowledge by describing and understanding various definitions of roles, strategies and actions related to educational change as defined by change agents themselves. For this purpose, we conducted in-depth interviews with 10 change agents of participating schools in a project on upskilling teachers in how to foster learning strategy use of their 5th grade secondary school students. The interviews were subjected to analysis using the documentary method. Initial results clearly suggest various orientation frameworks of change agents within which educational change is handled, different degrees of responsibility felt regarding educational change, dissimilar attitudes towards colleagues and orientation towards process or a focus on innovative products. Further results and conclusions will be presented at the Conference.

**Transforming Knowledge for Teaching with Technologies: A Learning Trajectory Instructional Approach**

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This multiple case, descriptive study examined the influence of a learning trajectory approach designed for developing teachers’ technological pedagogical content knowledge (TPACK) for teaching mathematics and science with three different classes of technologies. The researcher-designed learning trajectory for the three-course technology sequence in an online, distance-delivered graduate program interwove descriptive tasks with specific instructional strategies for engaging K-12 in-service teacher participants in experiences designed for guiding learning mathematics and science with these technologies. Each course in the sequence focused on a specific technology type: (1) data analysis software; (2) hand-held data gathering device; or (3) digital image and video technologies. This rich description demonstrates the influence of learning trajectories situated in a social-constructivist instructional framework in an online course delivery on participants’ thinking about their own thinking about learning mathematics and science and their thinking about the curriculum, instruction and their students’ thinking and understanding when learning with these technologies.
This trajectory focused on teachers’ thinking about the role of technology in learning along with thinking directed toward students’ thinking and understanding with the technologies. The online instructional learning trajectory infused social-constructivist pedagogical practices that engaged teachers in ongoing collaborations, interactions, and reflections for thinking about teaching with technology. The study concludes by proposing an explanatory framework describing how a designed learning trajectory instructional approach influences teacher’s TPACK transformation.

**Teacher e-portfolio for self-appraisal and improvement: development of an Italian tool**

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Teacher appraisal is currently a topic of great interest as well as intense debate internationally, one where there is the least comparability across different countries: scope, objectives, procedures, uses of results vary considerably. In Italy, a true and proper teacher appraisal framework and teaching standards are lacking, while there is evidence that teachers have positive attitudes towards their own profession and are intrinsically motivated to do well. In addition, Italian teachers do not reject their own appraisal, but rather some of its potential distortions. In order to overcome such problematic areas, the Teacher and Training Quality Management Project (TQM) is aimed at producing and testing a teacher performance measurement system, with the ultimate goal to contributing to a stronger accountability and particularly to improve teacher quality in the Italian VET system. Scope of this contribution is to present the theoretical framework at the basis of TQM’s e-portfolio development. The methodology has benefitted from a three-fold focus: knowledge transfer from two significant European evaluation experiences considering self-evaluation as a training and development process (one Austrian, the other from Northern Ireland); an international review of literature on teacher appraisal; a pre-experimentation questionnaire to poll teachers’ opinions, attitudes and propensity towards teachers’ own assessment and self-assessment. The result is a set of theoretical propositions for e-portfolio development which serves the purposes while avoiding pitfalls, such as to make use of rewards and punishments for underperforming teachers, while enhancing their intrinsic motivation and propensity to improve. A factorial model of teacher-dependent variance in student learning outcome is also provided.

**Pre-service primary school teachers’ beliefs about learning and teaching science**

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Beliefs about learning and teaching are critical components of teachers’ professional competence. They have been shown to affect children’s learning at school. In particular, constructivism-based beliefs of learning and teaching, in contrast to transmission-based views, are related to a deeper learning. Identifying, evaluating, and challenging teachers’ beliefs should thus be an integral part of teachers’ professional training and development. This is particularly true for training in science teaching, where teachers are usually faced with students’ deep-rooted misconceptions about natural phenomena. The aim of this cross-sectional study was to examine whether and to what extent pre-service primary school teachers change their beliefs about science learning and teaching in the course of their education program, which contains courses specifically designed to challenge such beliefs. Furthermore, we examined to what extent this change depends on their science-specific self-
efficacy, content knowledge and general educational level. Our findings revealed significant differences across second-, and third-year students. These differences were related to an increase in beliefs associated with learning as conceptual change on the one hand, and to a decrease in transmission-based views on the other. Interestingly, cohort-specific differences of conceptual-change-based views were significantly moderated by self-efficacy. Furthermore, significant relationships could be found between the students’ beliefs and content knowledge. Implications of these findings for teacher education and professional development will be discussed.

Psychological knowledge for teachers – Domain structure and learning opportunities

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The aim of this study is to develop a test to measure psychological knowledge of teacher candidates and to relate individual knowledge differences to candidates’ learning opportunities. Test development was based on expert evaluation of important psychological topics within the content areas of learning, development, and assessment. After administering the test to 3273 German teacher candidates we collected construct validity evidence and related test scores to learning opportunities. Following multidimensional item response theory, results indicate a two-dimensional latent structure (learning/development and assessment) with test scores related to formal learning opportunities (university teacher education vs. lateral entry; type of teacher education program). Further, a small interaction effect between the number of course hours and general course quality could be found for the learning/development dimension. Results suggest validity evidence of test scores whilst stressing the necessity to consider the individual uptake of formal learning opportunities.

Student teachers’ expectation bias: The nationality of students affects judgments and stereotypical

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Among other students’ attributes, nationality might be a factor which activates stereotypical beliefs. In Germany, Turkish students represent the majority of students with immigration background and they are expected to be less academically competent than other students. Teachers and student teachers are likely to possess these stereotypical beliefs. We investigated the influence of students’ nationality on student teachers’ judgments and stereotypical beliefs. Student teachers read either an stereotype-confirming description or a stereotype-disconfirming description of a Turkish student. Then they judged the student’s German language proficiency and answered questions concerning their own stereotypical beliefs about students with immigration background. Results showed that
student teachers’ judgments were biased by nationality when judging a stereotype-confirming Turkish student. Stereotypical beliefs changed into slightly more positive ones when teacher students were confronted with the stereotype-disconfirming student. The relevance of the results for teacher education is discussed.

**Portrayals of European teachers created in a simulation game**

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Internationalisation in teacher education means cooperation in research and education. To promote this, five teacher education institutions established an Erasmus Intensive Programme for their students to study together. This paper describes how the student teachers’ learning experiences were compiled by an open task and through the use of ubiquitous mobile technology. The concept of educational digital stories was highlighted and the method was used to serve learning. In this setting digital storytelling was used as a learning tool when the multicultural student groups combined text, sound and image showing visible results of the learning over the intensive course.

**Pedagogical content knowledge in business and economics: Test development and validation**

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Research indicates that the professional competence of teachers is important to the learning outcomes of students. However, reliable methods of assessing the pedagogical content knowledge of future business and economics (B&E) teachers remain unavailable. Thus, the research questions in the present project are as follows. (1) How can we conceptualize the pedagogical content knowledge of future B&E teachers? (2) How can the domain-specific model already developed be translated into a measurement instrument? A theoretical model of pedagogical content knowledge which takes into account the domain-specific features in B&E education as well as the necessary cognitive base a teacher needs for dealing with B&E-specific situations has been conceptualized. Based on this model, a standardized paper-and-pencil test was developed for an empirical study and was administered (spring 2011) to 338 university students, teacher trainees and experienced B&E teachers. Analyses were conducted to assess the assumptions of the structural theory as well as the psychometric quality of the implemented items. In addition, further analyses helped validate the test instrument. Regarding the implications for educational practice, a better understanding of pedagogical content knowledge may help provide tailor-made learning opportunities in B&E teacher education.

**Significance of context conditions for internal consistency of mathematical beliefs and practices**

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Abstract The Study is part of the interdisciplinary research project ‘AnschlussM’ that is focused on the alignment of professional beliefs and teaching practices among mathematics teachers in institutions of pre-primary education and primary school. The aim of this study is to examine the
impact of context conditions on the internal consistency of kindergarten and primary school teachers’ mathematical beliefs and practices in two states (Bremen and Baden-Württemberg) and to develop a structural equation model that describes the impact of personal and context variables on professional beliefs and teaching practices. The methodological design includes a questionnaire-survey as well as technology based assessment. Combining these methods makes it possible to elaborate mathematical teaching practices on a cognitive as well as operational level. Additionally, this approach allows for testing the alignment of teaching beliefs and practices considering specific context conditions. It is expected that the estimation of everyday work as stressful or pleasant depends on a certain degree of experienced demands or on a cumulation of specific stressful context conditions. Furthermore, context conditions of kindergarten and primary school causing consistent respectively inconsistent mathematical beliefs are assumed.

Feedback in Foreign Language Writing: Mapping teachers’ pedagogical content knowledge

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This paper presents the findings of the first stage of our research on change processes in teacher cognition and practice regarding feedback in foreign language (FL) writing tasks. Data analysis focused on defining the categories of the pedagogical content knowledge of five FL teachers of French about feedback on writing tasks in the upper secondary classroom. Knowledge and beliefs were elicited by teachers’ reactions to metaphors on teaching and learning, concept mapping, semi-structured interviews, classroom observation and stimulated recall. Data revealed that all five teachers were preoccupied by language-related concerns, giving minimal attention to discourse-related or (meta)cognitive aspects of writing: writing was used to develop language proficiency, as in writing to learn. Teachers usually employed a product-centered approach to writing, including insistence of grammatical accuracy, reducing writing to a grammatical exercise. Contextual factors such as team agreements, workload, and a product- and grammar focused teaching culture in their schools, made it difficult for teachers to implement a process- and meaning-oriented approach in their feedback practice. Comparisons of the content of teachers’ concept maps with classroom observations revealed for all five teachers inconsistencies between their beliefs and practices. With this inventarisation of teachers’ PCK and their feedback practices we were able to identify some relevant aspects for teacher interventions that will be used for the design of teacher interventions to optimize their feedback practices that in the end might contribute to students’ learning of FL writing skills.

Professional knowledge related to making connections through overarching mathematical concepts

Sebastian Kuntze
Professional knowledge of mathematics teachers related to overarching concepts in mathematics can enhance their competencies of designing rich learning opportunities in the mathematics classroom. However, models of professional knowledge of mathematics teachers and prior empirical studies have mostly emphasised specific components of content knowledge areas rather than focusing on knowledge relevant for making connections between different mathematical contents through overarching concepts. Responding to a need of empirical research into professional knowledge related to overarching concepts in mathematics (such as using multiple representations, dealing with infinity, or reasoning/finding arguments), this study presents quantitative results of a test administered to more than 50 German in-service and more than 100 pre-service teachers. The results indicate that the pre-service teachers were often unable to discern overarching concepts behind mathematical contents and to link elements of content matter according to these overarching concepts, whereas in-service teachers showed a richer content knowledge with respect to making connections through overarching concepts, especially those teaching at academic-track secondary schools. However, even many of the in-service secondary teachers were unable to answer all test questions appropriately. The results suggest that such content knowledge increases in the process of professional development. Moreover, the findings call for an emphasis in teacher education not only on segments of content matter knowledge, but also on overarching concepts and meta-mathematical ideas.

Sources of Variance in Student and Teacher Perceptions of Teacher Agency and Communion in Class

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The degree of agency (i.e., interpersonal influence) and communion (e.g., affiliation or warmth) teachers convey in class is an important predictor of student outcomes. On the other hand, teacher self-perceptions are an important point of action in teacher professional development and are used in scientific studies. A fallacy in using interpersonal perceptions, such as perceptions of teacher agency and communion, is pseudo-unilaterality: disregarding that interpersonal perceptions are dyadic because the characteristics of the perceiver, the target and the specific relationship of perceiver and target, do influence perceptions. Social Relations Model analysis was performed to estimate the relative importance of these sources of variance for self-perceptions and average class ratings of teacher agency and communion (109 teachers, 106 secondary school classes). It is concluded that communion is a rather systemic concept, which depends heavily on the specific relationship of a teacher and a class. Agency depends much more on the person of the teacher in both self-perceptions and class ratings. Further, it is not the case that some classes systematically rate teachers as higher on agency or communion and others systematically lower. Hence, there are at least two main points of action when improving the classroom social climate: while with regard to agency, the teacher as a person seems to be the most promising focus, regarding communion the
specific relationship a teacher and a specific classroom group have established seems a more promising point of attention.

**Social Class and School Performances: A Matter of Self Efficacy**

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Past research has shown that both sociological (e.g., socioeconomic status) and psychological factors (e.g. self-efficacy) affect school performances. In this research, we argue that a seemingly psychological mechanism (self-efficacy) actually comes from social status. Moreover, students are led to internalize social status differences, which may further explain their poor school performances. In two studies, teen aged students (Study 1) and children’s (Study 2) self-efficacy was examined as a mediator of the link between students’ socioeconomic status and school performances in mathematics and French. Results support that socioeconomic status affect school performances and that self-efficacy is a mediator of this effect. Thus, a seemingly psychological factor (i.e., self-efficacy) actually depends on social status, and can further explain why low status students perform more poorly than high status students in school.

**’I Have an Instrument to Measure Teachers’ Aggression, and I Am Not Afraid to Use It!’**

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Aggressive behavior in schools is usually conceived of as student aggression against their peers, sometimes also against their teachers. In contrast, teachers’ aggression has attracted much less research attention. This may be due in part to the fact that teachers have a particular responsibility for their students; some types of aggressive behavior (e.g., physical aggression) are even considered illegal in many countries. Hence, teacher aggression is a brisant research topic. Another reason may be that up to now, no valid measure of teacher aggression has been proposed. Our study presents evidence for the validity of the Teacher Aggression Scales (TAS) based on more than 1,000 eighth-graders and an additional 274 adult learners. Perceived and experienced teacher aggression were validated against positive teacher behavior, class and school climate, student aggression, student self-esteem, grades, academic and social self-concept, personality, and school-related affect. Correlations yield evidence for the validity of the TAS. Furthermore, measurement invariance was
examined. Overall, results show the TAS to be a valid and easy-to-understand measure of aggressive, abusive, and unfair teacher behavior as perceived by their students.

**A communicational perspective for understanding processes of conceptual change in dyadic interaction**

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We offer a new ‘communicational’ tool of analysis for looking at social interaction in an experimental design aimed at eliciting ‘socio/commognitive conflict’ in a proportional reasoning task. This lens is used to examine closely the ‘mathematizing’ and ‘identifying’ processes that occurred in a case of two 9th grade students (a boy and a girl) who both started out at a low-level of proportional reasoning and advanced to a higher level without an expert’s guidance. The analysis revealed that though the mathematical contribution of each of the students in the dialogue was rather equal, the girl was implicitly identified as the leader in the conversation while the boy mainly followed her. Consequently, the girl individualized the proportional procedure they had collaboratively ‘invented’ for solving the task, while the boy showed lack of confidence by erasing his proportional solution half-through and going back to a lower-level routine. We use this case to bridge between Piagetian and socio-cultural theories of learning by showing how an expert’s discourse is embodied in the design and the tool afforded in the learning setting.

**ICT leadership and leadership styles**

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A study from 2011 of 308 Norwegian school leaders in primary and lower secondary school is used in this paper to construct four indicators of school leadership for ICT and to investigate these indicators with other higher-order concepts of leadership; distributed, pedagogical, transformational and managerial leadership styles. The indicators of school leadership for ICT correlates positively with the variables on leadership style. Linear regression analysis reveals that managerial leadership style is the most prevalent predictor of school leadership for ICT. The study points to possibilities in connecting specific descriptors for ICT-leadership in schools to more broad categories for general leadership.

Do students benefit from combining various collaboration tools when working in a CSCL setting?

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In this study, we focus on students’ patterns of participation in CSCL settings in which the combined use of different technological tools (forum, chat, wiki) is promoted in order to solve a small group task. Following an observational, case study methodology, two small groups of graduate students in a virtual course were studied. Each small group had to collaboratively design and elaborate a WebQuest for primary or secondary students. They were scheduled three weeks for solving this task. The analysis included graphical maps of students’ participation and a content analysis of students’ discourse. Preliminary results suggest that although individual students participated differently in the different contexts and the groups showed different patterns of use of these contexts, they seemed not to benefit from the particular affordances and potential of each tool.

Blogs – A tool to improve students’ learning processes, teachers’ teaching quality or even both?

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High hopes are pined on social software as tools to improve learning settings at school. Especially blogs are accredited with great potential to design formal learning scenarios. Based on theoretical thoughts as well as on descriptive studies and best practice reports, they seem to be well suited to improve students’ learning processes by increasing students’ motivation and fostering reflection
processes. The presented research tries to verify these assumptions by using a quasi-experimental mixed method design. The study took place at three secondary schools in Baden-Wuerttemberg (Germany). While the results of the qualitative data (25 interviews, 342 blog posts and 1,115 comments) strengthen the mentioned assumptions, the analysis of the quantitative data (127 questionnaire sets) could not confirm the findings of former descriptive studies. Neither in the control group nor in the experimental group a significant impact on students’ motivation could be measured. But another interesting finding results from the teacher interviews. They reported that blogs gave them additional information about their students and thus the possibility to adapt their teaching style. Against this background we want to discuss the question if blogs are primarily helpful tools to improve students’ learning processes, teachers’ teaching quality, or even both.

The effect of prior knowledge and support on students’ self-regulation in computer-based instruction

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An ongoing issue which is yet to be fully resolved is the role of instructional support on improving students’ self-regulation, and hence learning performance. The purpose of this study was to examine whether various types of support enhance students’ SRL processes as they learn in a computer-based learning environment (CBLE), and whether this enhancement is moderated by prior knowledge. 63 university students with different prior knowledge levels received one of three types of support (worked-out examples, completion problems, and conventional problems), embedded in a CBLE designed according to the 4C/ID model (Van Merriënboer, 1997). Following Winne and Hadwin’s model (1998), the core SRL processes were assessed using a cued retrospective recall with the participants’ eye-movements as a cue. Regression analyses indicated that low prior knowledge students perform better in CMP condition, while high prior knowledge students performed better in CVP condition. However, a similar expertise reversal effect was not found for WE condition. Furthermore, although students in WE condition attained the same performance as the students in the other conditions, they experienced a lower cognitive load. Analyses of the verbal protocols showed that low prior knowledge students benefit from the provided support in the sense that they increased the use of specific SRL processes during learning, whereas for high prior knowledge students this support was superfluous. Furthermore, students’ SRL processes were dominantly characterized by monitoring, which is inherent given its importance during the entire learning process. The results will be discussed in relation to the nature of metacognitive processes.

Six steps to reducing test anxiety in secondary school students: An outcome study

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This paper reports an outcome study for a cost-effective, computer-delivered, and multimodal test anxiety intervention for secondary school students. Self-report data were collected from 3,225 students with a mean age of 14.97 years (SD = 0.73), from ten English schools. Test anxiety was the principal outcome variable and we examined the extent to which academic buoyancy was important in determining the likelihood of a successful reduction in test anxiety. Results indicated that, for those highly test anxious students who completed the intervention and who reported low academic buoyancy, there were significant reductions from pre- to post-intervention in worry and tension components of test anxiety. There were no significant reductions in test anxiety for students who reported low to mid academic buoyancy, or who were low to mildly test anxious. These findings show that it is possible to reduce exam-related anxieties and worries in a relatively short space of time, using an intervention that does not rely on specialist expertise for delivery.

Attitudes towards immigrants among 15 year-old secondary school students in a Hungarian city

This paper summarizes theories on attitudes towards immigrants and presents the outcomes of a recently conducted research revealing 15 year-old students’ attitudes and factors shaping these attitudes. In many previous studies it has been shown that intergroup anxiety and the symbolic and realistic threats caused by immigrants affect attitudes toward them. The aim of this study is to reveal students’ attitudes towards immigrants in a Hungarian city called Szeged and to compare our outcomes to those of internationals. For this reason the applied instrument included items originally used in the IEA ICCS 2009. Students judged 19 statements about equal rights and opportunities for immigrants including educational, economical and voting rights on 1-5 Likert-type scales. Results show that adolescents have tolerant attitudes towards immigrants in general, they agree with positive statements, but in the majority of the cases there are groups of neutrals who neither agree nor disagree with the statements. Students are the most supportive in the case of cultural aspects, and are the most dismissive in economical aspects. The comparison of the outcomes shows, adolescents participating in ICCS 2009 were more supportive of the voting rights for immigrants, while Hungarian students are more dismissive of these rights. In order to explore factors influencing and shaping the adolescents’ attitudes, exploratory factor analysis were used (KMO=0.89) which revealed four dimensions of the attitudes towards immigrants.
Empirical studies into meaning systems surrounding implicit theories of intelligence typically entail two stringent assumptions: that different implicit theories and different effort beliefs represent opposite poles on a single scale, and that implicit theories directly impact the constructs of motivational and goal orientation type (see e.g. Dweck, 1999, 2002; Dweck & Master, 2008; Dweck & Leggett, 1988; Dweck & Molden, 2005; Molden & Dweck, 2006; Plaks, Levy, & Dweck, 2009). Few studies, however, put these assumptions explicitly to test. And where bivariate relationships between related constructs are incorporated, these are in general too weak to suggest the consolidation into a single construct. This refers both incremental and entity positions (Chen & Pajares, 2010; Elliott & McGregor, 2001), and negative and positive effort beliefs (no published empirical studies). Through an empirical study based on 4594 first year business and economics students in a problem-based learning program, we demonstrate that relieving these stringent assumptions, and thereby using the meaning system framework to its full potential, provides strong benefits: effort beliefs are crucial mediators of relationships between implicit theories and goal orientation and achievement motivation, and the different poles of implicit theories and effort beliefs do expose different relationships with goals and motivations. Structural equation modeling is applied in deriving these outcomes. Instruments used are Dweck’s (1999) Theories of Intelligence Scale, Self Form for Adults, Dweck’s (1999) and Blackwell’s (2002) measures of Effort beliefs, Grant and Dweck (2003) instrument for learning and performance goals, and the Academic Motivation Scale (Vallerand et al., 1992).

What Features Make Decorative Illustrations in Multimedia Learning Environments Interesting?

Illustrations are typically used in multimedia settings for supporting cognitive processing by different functions (e.g., representational). Some illustrations have a (mainly) decorative function. They show hardly any relationship to the text content and have therefore no direct supporting function. However, they indirectly support cognitive processes by triggering situational interest, which leads to deeper processing. We were interest in which illustration features are responsible for triggering...
situational interest? Additionally, how can we know whether empirically found interrelations between these features and situational interest triggered by illustrations are ‘substantial’ or just due to individual interest or other third variables such as differences in prior knowledge? To answer these questions, we analyzed the ratings of diverse decorative illustrations with regard to situational interest and to four potentially interest-triggering features (concreteness, personal relevance, ease of comprehension, and unexpected information). To control for confounding variables we used multilevel modeling in an unusual way: Situational interest was predicted by the 957 ratings of the four features on an intra-individual level (level 1). Inter-individual differences in ratings were controlled by modeling individuals on level 2 (n = 87 high-school students). We found that concreteness, personal relevance, and ease of comprehension triggered situational interest. Unexpected information had no unique effects in this respect. Nearly 55% of the variance of situational interest was explained by inter-individual differences. This result shows that it is sensible to conduct multilevel analysis in order to control for the substantial inter-individual differences. The study provides foundational knowledge for designing multimedia environments.

**Assessing learning and comprehension of and with texts and graphics**

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This invited EARLI SIG 2 ‘Comprehension of text and graphics’ symposium aims at examining the assessment of learning and comprehension of and with texts and graphics from a number of different perspectives. By assessment, we mean test and measurement methods and techniques for educational, societal, and scientific purposes. In line with the focus of SIG 2, such assessments concern comprehension and/or learning, as well as the skills that are needed to process the manifold forms in which information comes in today’s society, such as texts, multiple (electronic) documents, pictures, graphs, diagrams, concept maps, animations, equations, scientific and information visualizations, multimedia, and hypermedia. The symposium contains four presentations that deal with measuring representational competence (Sandra Nitz), using texts and graphics in test material (Ric Lowe & Jean-Michel Boucheix), the relation between theories of comprehension and the nature of everyday reading tasks and activities (Jean-François Rouet & Anne Britt), and processes and products in large scale competency tests (Johanuss Naumann). These contributions will be critically discussed by Raquel Cerdan.

**Developing and Testing a Measure of Representational Competence in Biology**

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Interpreting, constructing, transforming, and evaluating different scientific representations are crucial skills for learning science and have been referred to as representational competence (RC). It is important to foster these skills specifically in science classes. To develop and evaluate learning environments that foster RC, a specific measure of RC is needed to assess these skills adequately. In
this project, a measure of RC was developed and tested in three steps. First, a specific teaching unit (photosynthesis) was chosen as the educational context of this study. Open-ended items were used to identify students’ conceptions on how to represent photosynthesis (N = 80, Grade 11 and 12, German secondary school). Second, closed items were created based on this analysis and tested in a pilot study (N=67). Third, 12 tasks with 18 closed items were utilized in the final measure based on preliminary analyses and theoretical assumptions and administered in 45 Grade 11 and 12 classes (N=931). These items included different scientific representations, i.e. scientific texts, logical and realistic pictures, and symbolic representations. Confirmatory factor analysis showed that the RC measure including 15 items was one-dimensional and showed strong measurement invariance over time. The reliability was acceptable (Cronbach’s α=0.68). RC was related but separable from factual knowledge about photosynthesis (r = 0.54). Although the measure showed satisfying validity and reliability, further steps towards developing a more exhaustive measure of RC will be discussed.

**Graphics and Assessment: Challenges and Opportunities**

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It is clear that graphics are increasingly relied on in education to present key aspects of to-be-learned content. Graphics are now no longer mere ancillaries to textual information, but rather are vitally important to learning in their own right. Further, graphics are nowadays often used as components of assessment items in large scale testing programs (such as PISA and NAPLAN). Nevertheless, most assessment in both classrooms and educational research still relies primarily on text rather than graphics. In the present context of a society immersed in visual information, we can wonder if this is an outdated and inappropriate situation. This paper will examine the relative merits of text and graphics as tools for assessment in classroom learning contexts, mass testing programs, and educational research. It will identify key challenges of using graphics-based assessments and suggest systematic ways in which these challenges could be addressed by using principled design of graphics test materials. Examples of forms of graphics-based assessments that have proven successful in educational research will be presented and the implications for adapting such approaches to use in classroom settings and large-scale testing programs discussed.

**Measuring literacy: Processes and products**

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In that presentation I would like to promote a model of test-takers’ reactions to literacy tasks in reading, and information and communication technology (ICT) literacy, that focuses not on test takers’ ‘skills’, but on task-engagement processes that directly govern which response to a task is ultimately given. Task-engagement processes are themselves predicted by the interaction of task demands, and test-takers’ resources in terms of their available procedural and declarative cognitive representations. I will illustrate the fruitfulness of this perspective through examples from recent computer-based large scale literacy assessments, the PIAAC study, and the PISA Digital Reading Assessments, that make available log files of test takers’ interactions with test items, and thus shed light on properties of their task engagement (e.g., efficiency, scrutiny). Seeing that for social practice, describing ‘proficiency’ or ‘skill’ of individual students is the ultimate goal, I might also discuss how
measuring properties of task engagement processes can be fed into literacy assessments to arrive at a more comprehensive description of what can be considered a students’ level of competency.

**Advanced reading literacy: Some theoretical issues and implications for assessment**

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MaryAnne Britt  
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In this presentation we consider a gap that may exist between current theories of reading comprehension (as seen from the point of view of cognitive psychology) and the nature of everyday reading tasks and activities. Theories of reading comprehension have tended to focus on the sustained reading of single texts for the purpose of understanding the message. However, naturalistic reading involves the search, comparison and integration of texts in addition to the comprehension of textual contents. These aspects of functional reading arguably involve specific processes and knowledge that may not be accounted for in traditional theories and assessments. We present a framework that aims at extending the construct of reading comprehension, by taking into account readers’ contexts and tasks and their integration of information from multiple texts. Then we reflect on the implications of such a framework for the assessment of reading literacy in teenagers and adults.

**From student to teacher: Assessing the processes and outcomes of learning to teach**

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Maaike Endedijk  
University of Twente  
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Kari Smith  
University of Bergen  
Norway

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University of Bergen  
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The SIG 11 invited symposium brings together 4 studies which jointly make a major contribution to our knowledge about assessing the processes and outcomes of student teacher learning. In the symposium we will discuss methodological challenges when measuring processes and outcomes of learning during the teacher education programme and internships. The study of Poom-Valickis and Lífström discusses the outcomes of a five-year project in which processes and outcomes of teacher education were measured using a multi-method approach. Their combination of quantitative and qualitative data examines student teachers’ thinking throughout the program. The study of Lehmann and Ebner presents the validation of a step-by-step developed tool of inquiry using metaphors to describe student teachers’ thinking about instructional activities. This instrument is helpful for understanding student teachers’ prospective instructional activities. The
study of Endedijk, Donche, Grischner, Hascher and Kreis presents a framework and questionnaire to measure the quality of learning to teach during internships. Data from The Netherlands, Belgium, Germany, Austria and Switzerland give insights into the validation of the framework for assessing the quality of student teachers’ learning in different countries. Haigh, Ell, Grudnoff, and Mackisack present a study on assessing teacher candidates’ readiness to teach. They present four types of evidence that experienced assessors use to assess and show how this procedure can be made robust and fair. The presentations will be brief to leave time for involving the audience in group discussions. The discussion will be led by the discussant Prof. Dr. Kari Smith.

**Student teachers’ development during their 5-year studies – assessing the longitudinal study**

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Erika Lofstrom  
University of Helsinki  
Finland

We set out to gain a holistic view of the processes and outcomes of teacher preparation in Estonia in terms of students’ professional development and preparedness for the future profession. We discuss the outcomes of the five-year process in light of the methods used and the data gained. We applied a multi-method approach starting with a cross-sectional cohort design utilising a survey on student teachers’ beliefs, teacher identity, self-efficacy, satisfaction with studies and reasons for choosing teacher education. We then followed up with the first-year cohort (starting with 310 students) through their third and fifth year (ending with 55 student teachers). Of these, we interviewed 13 elementary and subject student teachers, whose interviews and survey results constitute the focus of this paper. The nature of the study changed from a relatively large survey-based study to a small-scale qualitative interview study. While we cannot generalise our findings, we did gain a deeper insight into the processes of some of the students, helping us to understand the trends in the broader data set.

**Metaphors as tool of inquiry: Detecting the different views of pre-service and in-service teachers**

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Germany

Hermann G. Ebner  
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One of the most important challenges in education is to recruit and qualify the most eligible persons for the demanding job ‘teacher’ to assure a high quality of instructional activities. Therefore, it seems to be worthwhile trying to get clues of prospective teaching behavior before admission or in an early stage of qualifying respectively. According to the Cognitive Theory of the Metaphor (Lakoff & Johnson, 1980), metaphors are influential mental models. There is some evidence that they regulate how we perceive, think, and act. Thus, a reliable and valid metaphor-based instrument could be helpful for getting such clues concerning student teachers’ prospective instructional activities efficiently. The aim of the study to be presented is to validate our step-by-step developed tool of inquiry using metaphors to describe student teachers’ thinking about instructional activities. Beyond, we investigate significant differences in the selection of metaphors at different stages and circumstances in their teaching career. Students from the area ‘Economic and Business Education’
(n=317) and teachers (n=365) from nine vocational schools completed a questionnaire. The instrument consists of 28 metaphors. Exploratory factor analysis and t-test for independent measures are conducted. 20 metaphors can be classified in four subscales: (1) KNOWLEDGE WORK (α=.890), (2) SOCIAL SUPPORT (α=.770), (3) GOAL-/LEARNER-ORIENTATED LEADING (α=.729), and (4) DETERMINATE & DETERMINATING ACTIVITY (α=.706), which explained 57.4% of variance. Differences between the views of pre-service and in-service teachers are found. On this account, this predetermined set of metaphors seems to be a useful tool in the above mentioned area of application.

Assessing the quality of student teachers’ professional learning: an international validation study

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One of the tasks of teacher education is to develop student teachers’ conceptions and skills necessary for continuing professional development. In order to design teacher education programmes for stimulating these conceptions and skills, scientific knowledge is needed about individual differences in student teachers’ quality of learning process. Most instruments measuring individual differences in learning are only suitable for academic learning and not for contexts in which professional learning in practice is included. This study presents an international validation of a framework and instrument which were established by Oosterheert (2001) for studying the quality of learning to teach during internships. Oosterheert made a distinction between independent meaning-oriented; dependent meaning-oriented; reproduction-oriented; and survival-oriented learners, as measured by the Inventory Learning to Teach Process (ILTP). In the last five years, multiple studies have been carried out in Dutch-speaking countries using the ILTP, resulting in data set of over 500 Dutch student teachers and over 1000 Belgian student teachers, from various teacher education programs. A comparison between these two countries show that all four different ways of learning are not always found in the Belgian context. The ILTP has now been translated to German and data from Germany (N= 90), Switzerland (N= 160) and Austria are now collected and analyzed. The inclusion of these data in our analyses give insights in the validation of the framework for assessing the quality of student teachers’ learning in different countries and shows to what extent student teachers from different countries vary in how they learn to teach.

Assessing teacher candidates’ readiness to teach: What evidence is used in practicum settings?

Mavis Haigh
Is this teacher candidate ready to teach their own class? is a key assessment question faced by initial teacher educators when teacher candidates complete their final practicum experience. The decision is typically made by supervisors from the teacher education provider, in conjunction with the teacher with which the teacher candidate is placed. It is a high-stakes decision, for the individuals involved, and for the profession. There is little empirical evidence, however, about how such decisions are made. This study asked thirty experienced assessors of teacher candidates’ readiness to teach to enumerate the key factors they considered, and to describe the types of evidence they drew on, in order to arrive at their judgments. Four evidence types were identified through an iterative coding process, involving three raters (inter-rater reliability >0.85; disagreements resolved by consensus): documentation, professional discussion, observation and the opinions of others. These types of evidence were used in different proportions to evaluate key aspects of teacher candidates’ performance. Participants identified a rich range of evidence sources within these types, and were able to articulate what they were looking for in teacher candidates’ teaching. There were inconsistencies between participants, however, suggesting that the teacher candidates would be evaluated using quite different evidence in some settings. There are important implications of these findings for the professional development of all who supervise teacher candidates’ practical experiences, and for the teacher candidates themselves. Transparent and consistent assessment of teaching is critical to graduating teachers who can make a difference for students in schools.

**Affective and Social Outcomes of Education**

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Research on the outcomes of education has focused on cognitive competencies but has generally neglected students’ affective and social development. This symposium demonstrates how formal and informal educational settings influence students’ academic emotions, motivation, engagement in terms of school completion, and social activities. The studies presented address various affective-social outcomes, include student samples from various age groups, countries, and educational institutions, and use multiple methodologies such as longitudinal and quasi-experimental designs, structural equation modeling, econometric analysis, and neural network approaches. The findings consistently document the strong impact of educational settings on students’ emotions, engagement, and social behavior. From a broader educational perspective, the findings suggest that researchers, practitioners, and policy-makers alike would be well advised to focus more attention on the affective and social outcomes of education.

**Impact of Academic Attainment on Students’ Emotions: A Longitudinal Study of Reciprocal Causation**

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A theoretical model linking students’ academic achievement and emotional outcomes is proposed. Based on Pekrun’s (2006) control-value theory of achievement emotions, the model posits that students’ achievement and emotions reciprocally influence each other over time. In contrast to traditional unidirectional views addressing emotions as causes of achievement, the model emphasizes the importance of students’ academic achievement, and teachers’ feedback about achievement, for students’ emotional development. Data from the longitudinal Project for the Analysis of Learning and Achievement in Mathematics (PALMA) were used to examine the hypothesized reciprocal effects. The study included annual assessments of mathematics emotions (enjoyment, pride, anger, anxiety, shame, hopelessness, and boredom; Achievement Emotions Questionnaire-Mathematics; Pekrun et al., 2011) and mathematics achievement (grades and objective performance scores) from grades 5 through 10 (N = 3,530 students, 49.7% female). The results of cross-lagged structural equation modeling demonstrate that achievement and emotions reciprocally influenced each other over time, with achievement showing consistently positive effects on enjoyment and pride, and consistently negative effects on anger, anxiety, shame, hopelessness, and boredom across all six grade levels. These findings provide robust evidence for the proposed links between achievement and emotions. From a broader educational perspective, the findings imply that researchers and practitioners alike would be well advised to focus more attention on the emotional outcomes of students’ academic learning and attainment.

**Ascribing Writing Outcomes to Relevant Aspects of the Self and the Environment**

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Being able to ascribe one’s outcomes to relevant aspects of the self and the environment is an important aspect of academic and personal development. This study is part of a larger study that was set up to understand the variables that influence writing performance. Data was collected from close to 1500 vocational students of both genders (15, 20). Questionnaires were used to collect information about their home environment, daily writing habits, and writing skills. An authentic writing task assessed the quality of writing performance as well as appraisals, self-assessment, emotions, and attributions. These variables were measured on-line with a specially designed software program. Traces students left behind were also inspected (time spent, consulting instruction, using speller and other tools). The focus in this study is on the students’ causal ascriptions of their writing outcome. Attributions of perceived success and failure were causally linked to any of three factors, namely access to (in) adequate writing strategy use, (not) making use of self-regulation strategies, and (not) being in the mood for writing. We used Artificial Neural Network analyses (ANN) to examine how relevant task-specific cognitions and affects as well as complex relations between background variables (home environment, daily writing habits, writing skills) and writing process variables are associated with different levels of the 3 causal ascriptions. We will make an attempt to describe the nature of the writing environment that good and poor writers create for themselves.

School Completion in Canadian Schools

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Only about three out of every four Canadian students graduate from secondary school in the typical timeframe, which ranges from three to five years. Students who leave school before graduation find it difficult to enter the labour market, and if they do, to remain gainfully employed. Completing school is also related to a person’s long-term health and well-being. This study is based on data collected from over 130,000 Canadian students who completed the student survey Tell Them From Me in 2011-12. Earlier research identified twenty-five factors that are predictive of school completion. These are conceived as ‘assets’ on a student’s pathway to success. The analysis uses logistic regression models to predict each student’s probability of school completion and cluster analysis to discern different types of potential school drop-outs. The paper discusses how schools might intervene for students who are at risk of dropping out for differing reasons, and how school districts and a state/provincial can use Tell Them From Me survey data to inform school policy and practice.

Does the Internet Erode Students’ and Adults’ Social Activities?

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Does the advent of the Internet overthrow the fundamentals of society? Does a withdrawal into a virtual world alienate humans from one another? Or does the Internet facilitate inter-personal and civic engagement in the real world? Merging unique telecommunication data with geo-coded German individual-level data, we investigate how broadband Internet affects social activities of students as well as several dimensions of social capital of adults. We use panel information to estimate value-added models. In addition, we exploit a quasi-experiment in East Germany created by an unforeseeably mistaken technology choice of the state-owned telecommunication provider in the 1990s that still hinders broadband Internet access for many households. For children and adolescents, we find no evidence that broadband Internet access crowds out social activities in or out of school, but rather indications that it may support the attendance of social group activities outside school. Also for adults, we find no evidence that the Internet reduces social capital. In contrast to the television, the information and communication functions of the Internet seem to dominate the passive entertainment function.

Weight of language specific factors in writing development

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The challenges children meet in producing written texts and achieving text products are likely to be influenced by the languages/orthographies in which they learn to talk, read and write. The current state of our knowledge is largely determined by research with English speakers and readers/writers (Share, 2008). However, models of assessment and intervention based on the specific difficulties that English learners meet in writing may have a limited application to other orthographies. An analysis of writing development across languages is thus necessary for a better understanding of both the universal and language-specific features affecting the acquisition of writing skills in children. The focus of this symposium is on the role of transcription skills and language specific factors in writing development across a continuum of orthographic depth. Transcription skills have been identified as the major barrier to written text production in young English writers and current models of writing development represent them as gate-keepers in the development of writing skills (e.g. Berninger & Swanson, 1994). However, to date our understanding of factors affecting transcription and the role of transcription skills in more transparent orthographies is still limited (Arfe et al., 2012). The four papers presented in this symposium discuss the contribution of transcription and other language-specific factors in writing development in deep (English), intermediate (Portuguese) and shallow Spanish and Italian) orthographies, from a cross-linguistic perspective.

Spelling skills and their contribution in emerging Italian writers
Two studies are presented. The first study ascertains the extent to which results of the research and models of spelling development in French and English can be extended to a more transparent orthography, like Italian. One hundred and seventy Italian elementary school children from grade 1 to grade 3 participated. Their spelling skills have been examined through tasks of nonword spelling, word spelling and text dictation and the role of phonological, vocabulary and grammatical skills in accounting for their spelling performance was examined. Results show that also in Italian the development of spelling skills is related to children’s mastery of different kinds of knowledge beyond phonology and orthography (including grammatical knowledge). The second study examined the contribution of spelling, lexical and grammatical skills to written text production in Italian beginner writers. Eighty-three 2nd and 3rd grade students participated. Lexical retrieval (picture naming and rapid automatized naming), grammatical skills (receptive grammar and sentence generation), and spelling skills were assessed and children were asked to write a text on a set topic. A factor analysis revealed that two main factors (productivity and quality) explained 60% of the variance in performance of these young Italian writers. Regression analyses revealed that variance in text quality was explained by measures of spelling and grammatical skills while productivity was only explained by the participants’ age, where older children wrote more than younger children. In contrast to results from children learning to write in opaque orthographies, such as English, this study demonstrated that from the initial stages of writing, grammatical skills accounted for a significant proportion of variance in Italian written text production.

Exploring writing products in pupils with Language impairments and ASD

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Studies of pupils with developmental difficulties provide an opportunity to examine the differential impact of transcription skills on written text production. Using written texts from 157 school aged English speaking participants with learning difficulties we examined the predictors of writing fluency grammatical accuracy and text quality. Standardized measures of language, spelling, handwriting and cognition were used to examine relationships between transcription, oral language and cognition and the three dependent measures of written narrative. When transcription scores were significantly impaired this remained the major barrier to accuracy, grammaticality and fluency. However, even
moderate improvements in spelling skills revealed the impact of other cognitive processes in writing, even in English. These data indicate that written text products of pupils with developmental difficulties can capture underlying linguistic and cognitive difficulties. The data point to the importance of socio-cognitive skills in the text quality produced by writers but spelling skills for fluency and accuracy.

The Role of Transcription and Self-Regulation in Development of Writing Skills in Spanish Students

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The development of writing competence demands automatization of transcription skills and self-regulation of high-level cognitive processes of writing, such as, planning and revising. Thus, acquisition of writing skills is a highly cognitively demanding task for young students, who have not mastered the low-level transcription processes, as such transforming their ideas into written words on a paper consumes a high proportion of their cognitive resources. The high cognitive demands of the transcription processes in young students interferes in the implementation of high cognitive level processes of planning and revising, because both processes are competing for the same limited resources of the working memory. From a developmental perspective, in later years, once students have got a mastery of transcription skills, reducing the cognitive effort required, there are not cognitive limitations that constrain acquisition of high level cognitive processes and their self-regulated dominance. From this point of view, in the beginning of learning to write, transcription skills seem to be a main barrier in the development of a self-regulated dominance of planning and revising processes and in the quality of text production. In this study we explore, from an instructional perspective, the role of transcription and self-regulation in the development of writing skills during the initial years of learning to write, in Spanish language, which has a shallow orthography. The sample comprised 135 Spanish students of 2nd grade of Primary Education (7-8 years old), distributed in six classes at two schools of a city in the northwest of Spain.

Development of Portuguese students’ transcription skills and their impact on text production

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Even if few empirical demonstrations are available, it is usually professed that transcription skills constrain writing development and text quality across languages. Admittedly, this constraint should be alleviated when running from deep to shallow orthographies. In this regard, the intermediate depth of the Portuguese spelling system might be informative of a moderate load on text production. This load can be studied looking both at its impact on text production and text quality. To this end,
we studied the development of transcription skills throughout schooling and their impact on burst size, and text quality. Bursts are stretches of text continuously written to a given pause threshold (commonly 2 s). The study of bursts in novice writers and their relationship with transcription is scant. We asked 287 Portuguese students in Grades 2-7 to perform four tasks: alphabet task, sentence copying, dictated spelling, and narrative writing. Smartpens running HandSpy software were used to collect the online data. We found a growing trend in students’ transcription skills, along with an increase in the number of words written per burst. In Grades 2 and 7, burst size averaged 2.30 and 5.90 words, respectively. Moreover, we found that, across schooling, transcription skills made a significant contribution to burst size and to writing quality. While handwriting skills were the strongest predictor of burst size, spelling skills were the strongest predictor of writing quality. This study extends previous findings by showing that transcription skills constrain beginning and developing writers’ burst size, which, in turn, seems to be related to writing quality. As bursts are markers of writing efficiency, these findings are of strong educational relevance.

Interactive instruction: Why it is effective and how it may be improved

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Interactive forms of instruction—including one-to-one tutoring and small-group collaborations—are often found to be effective. Given the effectiveness of interactive instruction, it is important for education and learning researchers to uncover what makes it effective as well as ways it may be improved. The contributions to this proposed symposium shed light on these issues. First, Chi et al. found that pairs of observers learned more from videos of tutoring than from videos of monologues and observers learned as much as the tutees in the videos provided that both the observers and tutees were interactive and elicited elaborated contributions. Furthermore, shared experience between tutees and tutors improved tutoring via both development of common ground and increases in tutee contributions (Siler & VanLehn). Shared experience also led to tutors developing some accurate assessments of their students; however, this did not yield improved micro-adaptions to individual tutees. Herppich et al. found that tutors can be trained to tutor more interactively. However, training did not result in more accurate student assessments, a prerequisite to micro-adaptive tutoring. Finally, van de Pol et al. found that teachers’ support conveying general principles but not their adaptive support facilitated successful small-group problem-solving. However, learners had to be instructed on how to apply this general support. All contributions imply that there are aspects of interactivity—from simply interacting to micro-adapting to individual tutees—that may require more experience or even training. Further research on these aspects is needed to make interactive instruction even more effective.

Using tutorial dialogues as instructional materials for students to observe
Being tutored one-on-one directly by a tutor is the most effective way for students to learn. Unfortunately it is costly either to have a human tutor for every student or to develop intelligent tutoring systems. We present a new format of delivering instructional materials that takes advantage of the learning benefits from being tutored one-on-one, and yet is cost-effective. This new format consists of videotaping one-on-one tutoring and showing the videos to dyads of observing students. Observing students must watch the videos collaboratively in order for them to be actively engaged.

For college students, we found that pairs of students who observed such tutorial dialogues learned significantly more than pairs of students who observed tutorial monologues, comparable to a lecture delivered by the same tutor. Our findings did not generalize to middle-school observing students, largely because the tutorial dialogues involving a middle-school tutee were not as effective as tutorial dialogues involving a college tutee on a number of dimensions, such as the proportion of correct knowledge articulated by the tutees, the frequency of tutees initiating a comment or question, and the frequency of tutees giving long responses. We will consider a variety of reasons for why dialogues are superior to monologues as a form of instructional materials, and why tutorial dialogues were not effective for a younger population. We will close with speculation on the potential application of this instructional format for online learning.

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**The effect of shared experience on learning outcomes in one-to-one human tutoring**

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One-to-one adult human tutoring has been found to be among the most effective instructional methods (Bloom, 1984). It is commonly assumed tutoring is effective in part because tutors’ familiarity with their students allows them to adapt their tutoring to their students. In this paper, we test the hypotheses that tutors’ and students’ prior experience working together will (1) result in tutors developing accurate assessments of their students’ knowledge, allowing the tutor to select tutorial actions appropriate for the student, thereby increasing student learning, and (2) result in a larger conversational common ground, reducing misunderstandings, thereby boosting learning from the interactions. A 2 x 2 between-subjects experiment was conducted using 80 tutor-tutee pairs solving physics problems. Independent variables were shared experience (tutors either had or did not
Training tutors makes them more interactive but not diagnostically more attentive

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To provide adaptive instruction, tutors have to assess a tutee’s individual understanding. Tutors, however, have difficulty to do so because they do not regularly elicit information from a tutee that they could use for their assessment. We conducted a study in which tutors received a strategy training that aimed at fostering an interactive style of tutoring to help tutors to elicit diagnostically relevant information. To examine the effectiveness of the training, we compared the tutoring interactions and assessments of n = 20 trained tutors and n = 19 untrained tutors. Trained tutors elicited more knowledge deficits from their tutees and responded to these knowledge deficits less often with the correct answer and more often with scaffolding as compared with untrained tutors. However, trained tutors were not more accurate than untrained tutors in assessing a tutee’s understanding after tutoring. The findings suggest that the training was successful in making a tutor’s behaviour more interactive, thereby, enabling tutors to elicit information about a tutee’s understanding. Yet, the observation that the more interactive style of tutoring failed to benefit a tutor’s assessments after tutoring indicates that learning and executing a more interactive style of tutoring put a high burden on a tutor’s cognitive capacity. As a result, there was obviously not much cognitive capacity left to use the elicited information for assessing a tutee’s understanding. Trainings that focus not only on executing but also on automating strategies may be successful in enhancing a tutor’s assessment accuracy and, thereby, improve a tutor’s adaptiveness.

Scaffolding small-group work: Students’ uptake of support

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Uptake of teacher support during small-group work promotes learning. Knowing which characteristics of support facilitate its uptake is therefore essential. Support that is contingent and/or pertains to general principles is assumed to be taken up more easily than support that is non-contingent and only addresses specific answers. The current study investigates this claim empirically by analysing teacher-student interactions and subsequent student-student interactions in ten lessons of two social studies teachers and two of their groups of students. Providing support aimed at general principles resulted in students actually using/mentioning the support, not ignoring it. In addition, providing contingent support prevented students from showing off-task behaviour. Qualitative analyses showed that teacher modelling might play an important role in whether or not support is taken up and leads to correct group answers.

Improving strategy flexibility: Analyzing the effectiveness of different teaching approaches

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Strategy variety and strategy flexibility are major aims in mathematics education. To stimulate the acquisition of strategy variety and flexibility, teaching standards in numerous European and non-European countries recommend that students are introduced to a rich diversity of strategies that can be flexibly (or adaptively) applied on different mathematical problems. Despite the general consensus on the relative importance of strategy variety and flexibility, there is still discussion about how and when it should be taught to the students. Furthermore, recent investigations revealed that most students rather inflexibly solve mathematical tasks using one specific strategy. This symposium brings together four empirical studies aiming at analyzing the effectiveness of different teaching approaches for stimulating various and flexible strategy use in the domain of mathematics. All four contributions share the same major goal (deepening our understanding of the effectiveness of different teaching approaches for stimulating strategy variety and flexibility). The four contributions address this common goal by using a rich variety of teaching approaches and methodological designs and techniques, ranging from small-scale intervention and interview studies to large-scale interventions. The studies address different mathematical domains and age groups, ranging from single-digit and multi-digit operations in elementary school children up to algebra in secondary school students. The commonalities, differences and value of these contributions will be discussed by an expert in both the field of strategy flexibility and the field of mathematics education, Marian Hickendorff (University of Leiden).

Strategy use in single-digit multiplication of German 3rd-graders

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Multiplication facts can be taught and learned in different ways. Traditionally, single sequences of multiples were often taught in isolated ways. Taking into account methods of discovery learning, multiplication facts can be learned in a more holistic way. In this approach, students use basic multiplication facts to derive unknown facts by using different strategies. The strategies are based on number relations or relations between multiplication tasks. For some time they have explicitly been part of the concept to teach single digit multiplication in Germany. This approach is based on the assumptions that students can gain a deeper understanding of the operation and learn to choose strategies adaptively for different tasks. Results of an explorative study show details of strategic choices and give first signs, if these assumptions are justified.

The effects of two instructional approaches on students’ adaptive strategy use

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In mathematics education, two instructional approaches are suggested to teach children adaptive strategy use, i.e., solving computation tasks efficiently by flexibly choosing an advantageous strategy. The explicit approach encompasses the explicit teaching and practicing of selected strategies, whereas the problem-solving approach emphasizes the analysis of task characteristics and the individual generation of efficient strategies. In an experimental study, we examined the effects of these instructional approaches on students’ accuracy and adaptivity in arithmetics. Our sample comprises 68 3rd-graders from 17 school classes together with 154 classmates (as control group). The 68 children were divided into two groups attending a one-week holiday course. They were taught by two research assistants following ideal-typical teaching scripts of the explicit and the problem-solving approach. Data were collected by pre- and post-test and two follow-up tests (after 3 and 8 months). All tests consisted of 8 multi-digit addition and subtraction tasks suggesting specific efficient strategies. Consecutive tests were linked by 6 common items; 4 anchor items were part of all tests. ANCOVAs with repeated measurement indicate a desired specific and sustain intervention effect for students’ adaptive strategy use (in comparison to the control group, F(2,440)=14.49, p

Stimulating children’s strategy flexibility: Comparison versus sequential study of strategies

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This study aimed at stimulating children's flexible use of the compensation strategy and the standard written algorithm on multi-digit subtractions up to 1000 in two different learning environments. 40 4th-graders were offered worked examples of subtractions up to 1000 solved with the compensation strategy and with the written algorithm. We distinguished among 2 types of subtractions, namely subtractions eliciting the use of the compensation strategy and subtractions evoking the use of the standard written algorithm. Children from the compare condition (n = 20) were offered worked examples with each subtraction solved via both the compensation strategy and the written algorithm and were stimulated to compare the efficiency of the two strategies on each subtraction. Children from the sequential condition (n = 20) studied the different strategies sequentially and were prompted to focus on the strategies' procedural characteristics. Results revealed that the frequency and flexibility of compensation strategy use increased in both the compare and the sequential condition from pretest to posttest and retention test, but children from the former condition demonstrated greater gains in strategy flexibility than children from the latter one. We discuss the theoretical, methodological and instructional implications of these results.

Using comparison to improve students' flexibility and conceptual knowledge

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Comparison is a powerful learning tool that has been shown to improve learning in a variety of domains. A variety of short-term classroom interventions have shown the potential effectiveness of comparison for improving students' conceptual knowledge, procedural knowledge, and strategy flexibility. Here we report the results of a year-long randomized controlled trial examining the impact of researcher-designed supplementary curriculum materials that 'infused' comparison into the learning and teaching of Algebra I. 141 8th and 9th grade Algebra I teachers in the US were randomly
assigned to either use the supplemental curriculum (N = 70) or as a ‘business-as-usual’ control. No main effects of condition were found, likely due to wide variation in the frequency and quality of teachers’ use of the supplemental curriculum materials. However, among treatment teachers, both frequency of use and quality of use predicted gains in conceptual knowledge and flexibility. We interpret these results to suggest that the comparison curriculum, when used relatively frequently and with adequate fidelity, positively impacted students’ learning of mathematics.

**What can predictors of mathematical (dis)abilities tell us about Sustainable learning?**

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Studies on the foundations of mathematical abilities and disabilities have been receiving growing attention. The current interest is encouraged by the hope that, if predictors, can be addressed as key components in remediation programs, children may not fall further behind. Since working memory and magnitude representations or number sense are predictors of later school achievement according to some studies, the symposium sought out to extend our knowledge regarding the relationship of these predictors with mathematical abilities and disabilities. To better understand the causal pathways leading to the development of mathematical disabilities (MD) longitudinal data and will be used in study 1, 2 and 3. In addition since some studies define MD as persistent problems and others do not take into account this criterion, the results of a study not taking into account these criteria (study 3) and a study into account persistency criteria (study 4) will be compared. Moreover in study 4 it will be examined with a data-driven model-based clustering whether we can identify subgroups of individuals with MD. The theoretical and educational significance will be discussed. From a theoretical perspective, the symposium aims to identify ‘markers’ or precursors at an early age and identify children at risk of developing a MD. Moreover the symposium aims to raise questions about MD definitions including or not including persistency criteria and about the wisdom of placing individuals with MLD into a single diagnostic category. From educational perspective this might allow precocious intervention programs and reasonable adjustments, reducing gaps in mathematical achievement.

**Precursors of math: numerical understanding and working memory**

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Besides early numerical skills such as quantity discrimination and counting, also working memory skills provide an important basis for math learning. Little is known, however, about the nature of the developmental changes in basic numerical skills or about the causes of inter-individual differences therein. Therefore, the aim of the present study was to examine the co-development of verbal and visuo-spatial working memory and early non-symbolic and symbolic numerical skills. In this study longitudinal data is presented in which the reciprocal relations between cognitive skills and numerical abilities are examined. A sample of 267 Dutch Kindergartners was tested six times in a three-year period. Numerical tasks were administered to assess non-symbolic magnitude skills and symbolic counting skills. Cognitive abilities were assessed using tasks assumed to measure verbal and visual working memory skills. The results showed that visual working memory skills predict non-symbolic number skills whether verbal working memory skills predicted both non-symbolic and symbolic number skills and were related to math performance. These results demonstrate that domain-general cognitive abilities, in particular verbal and visuo-spatial working memory, influence math development at least partly through involvement in the development of domain specific numerical skills.

Cognitive precursors of mathematical learning in first grade children

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Many contributing factors, both domain specific and domain general, influence children’s performance in school achievement. The aim of the present study was to identify domain specific and domain general cognitive abilities predicting early math competence in first graders. We assessed 157 first-grade children (mean age 5.8 years-old, 80 males, 77 females) recruited from different primary schools of North-Eastern Italy. Within the domain-general aspects, both short-term and working memory have been tested; concerning the domain-specific skills, number sense abilities (e.g. rapid comparisons of quantities and approximate additions) has been investigated. Furthermore, the role of both verbal and performance intelligence has been analyzed. Hierarchical regression analyses have shown that the early math skills, tested at the beginning of the first grade, prior to the starting up of formal instruction, were predicted by both domain-general and domain-specific abilities. Particularly, working memory was the best predictor of math performance, followed by number sense. The role of intelligence, having a moderator effect, was however consistent, particularly the performance component.

Domain-specific cognitive deficits at the origin of mathematical difficulties: A longitudinal study

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In children with mathematical difficulties (MD), researchers have observed difficulties in fact retrieval and developmental delays in learning procedural strategies. It remains, however, to be determined whether these difficulties are due to impairments in the processing of numerical magnitudes per se (defective number module hypothesis) or to deficits in the access to numerical magnitudes from Arabic digits (access deficit hypothesis). Most existing research has focused principally on low achievement criteria for defining children with MD, without taking into account persistency criteria. Therefore, the purpose of this study was to contrast the defective number module and access deficit hypothesis in children with persistent and non-persistent difficulties in mathematics. We used a longitudinal design. At two time points, we assessed arithmetic strategy use as well as symbolic and nonsymbolic magnitude processing. Findings revealed that typically developing children were significantly more accurate, significantly faster and relied significantly more frequently on fact retrieval than children with persistent and non-persistent MD. Group differences in reaction time on symbolic but not nonsymbolic tasks were observed. Children with persistent MD were significantly slower than typically developing children, suggesting that the arithmetical difficulties of these children are linked to their impairments in accessing magnitude representations from Arabic symbols.

Precursors and predictors of subtypes of mathematical disabilities

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Until now, no data-driven cluster analysis with large samples that include children with varying degrees of math skills has been reported. To improve our understanding of mathematical abilities and disabilities (MD) such a model-based clustering was used on 391 elementary school children to identify subgroups of individuals with relatively homogeneous profiles. In addition reading and spelling of these children was tested. The best data-driven solution was a model with two clinical MD clusters (a cluster with number fact retrieval and procedural calculation problems and a cluster with only procedural calculation problems) and a cluster of children with age adequate mathematical abilities. Children with semantic memory subtype of MD had also the most (severe) problems on
reading of pseudo words comparison to the procedural subtype, except for spelling. Based upon the findings of this study, clinicians should be encouraged to test procedural calculation as well as number fact retrieval but also reading and spelling in children with MD. Secondly, our results raise questions about the wisdom of placing individuals with MD into a single diagnostic category since children with deficits in procedural calculation and number fact retrieval skills may be distinct from children with isolated procedural calculation problems leading to other needs for reasonable adjustments.

**Learning through interaction at work: Interpersonal and other forms of inter-psychological mediation**

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Interactions at work are a key means by which learning and development arise in workplace settings. Because much of the knowledge required for effective workplace practice arises through history and culture (i.e. occupational requirements), and is manifested in particular workplace settings (i.e. situational requirements) there is a need to access and engage with these forms of knowledge. The mediation of this knowledge is often referred to as being inter-psychological within a Vygotskian perspective. Much of the focus of this mediation is that occurring between more (e.g. expert) or less experienced (e.g. novice) social partners. However, there is also the mediation between artefacts (e.g. tools, concepts) and indirectly with other social partners (i.e. observation, listening). Moreover, there is also the mediation that is enacted by individuals (intra-psychologically) and what they bring to the particular inter-psychological process: the personal basis of the mediation provided by others and artefacts. Whilst theorising associated with the inter-psychological is well-advanced, negotiations with symbolic and material practices, and in particular, how intra-psychological processes mediate these contributions is less well developed. The collection of contributions to this symposium address different forms of mediation and learning through interactions at work and, in doing so, explore the character of interpersonal, between persons and artefacts and intra-psychological processes that constitute learning arising through work and in the circumstances of work. They bring diverse, yet compatible conceptual orientations, and draw upon studies from a range of different kinds of occupations in advancing accounts at work of how interactions mediate learning and development.

**Mentoring early childhood educators at work: an interactional and multimodal perspective**

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Recent literature in the field of workplace learning has stressed the importance of guidance in the process of learning in and from practice (Billett, 2001). Workers do not only learn just by conducting specific tasks individually; they learn when adequate resources are afforded to them and when more experienced workers are able to share their knowledge and skills and assist them in their practice. Hence, there is considerable importance to investigate the specific qualities of guidance at work and to understand how learning workers engage with these resources. In line with previous research conducted in various technical trades (Filliettaz, 2011), the talk will address the topic of guidance at work in a distinct and specific context: that of early childhood educators and their vocational training. In the Swiss VET system, early childhood educators move back and forth periods of teaching in vocational schools and periods of practical training in institutions caring for pre-school children. During their internships, students are supervised by mentors, who assist them in their early days at work. In a research program currently conducted at the University of Geneva, we aim at understanding how these mentors provide learning opportunities to students, and how students engage with these opportunities. The talk will consist in presenting the general objectives and methodological specificities of this research program, based on audio-video interaction analysis. It will also report on results emanating from this research program and stress diverse interactional strategies used by mentors to endorse tutoring functions towards students at work.

How does context mediate learning at work? - Cases of design engineers and surgical physicians

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Studies in the area of workplace learning have shown that work context is one of the most important factors mediating work practices and learning (e.g. Collin 2006). Therefore, the aim of this paper is to explore context as a mediating factor on learning in two work communities: an engineering company and a surgical clinic in a hospital. Especially, the aim is to compare two work contexts and find similarities and differences between them in relation to how context mediates learning. By context we can mean different aspects, such as material and symbolic tools and conditions of workplaces. It can also refer to the social relations and interaction in the workplace, or to unofficial power relations (see Collin et al. 2011). In this paper, context is approached as a relation between the actual work tasks (practical work activities) and the cultural and social relations of the workplace. Ethnography will be utilized as a methodological approach. Empirical data has been collected among design engineers (n = 8) in 2007 and surgical physicians and residents (n = 11) in 2009. Onsite observations (shadowing) and interviews with the observed employees after observation periods have been utilized in collecting data. Analytical tools include ethnographic and content analysis. The comparison of the two work environments will lead to the description of challenges and constraints on learning in the workplaces, which are connected to various contextual aspects of workplace practices.

Mediating occupational learning at work

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This paper offers an account of learning in the circumstances of work being premised on relations between social and brute mediating facts and the personal process of mediation. In recent times, most accounts of the mediation of knowledge and learning have been those associated with signs,
symbols and artefacts and proximal social influences on human cognition. Overlooked in these accounts are the mediating influences of the brute facts (i.e. nature) both beyond and within individuals, and also how individuals mediate what is suggested to them by the social and brute world. Yet, there is also the need to account for how intra-psychological or intra-mental contributions and processes mediate that learning. Here, a distinction is made between the institutional and brute factors that mediate learning and individuals’ mediation of those factors. This personal mediation is often active, intentional and directed by personal factors, yet subject to competing demands, limits in capacities, understandings, intentions and energy (e.g. weariness), and also just plain, imprecise, hazy and ill-directed processes comprising human cognition. Conversely, the potency of the brute and social worlds’ suggestion is subject to its exercise that varies across situations and circumstances, and how individuals consent and engage with these mediating factors. So, to understand processes of mediation more fully requires a consideration of both inter-psychological and intra-psychological processes, and the relations between them. These issues are discussed and explained using work and work-related activities.

**Trainees’ everyday experience of learning from social interaction at work**

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Social interaction in the workplace is a powerful means by which, in particular, novices (e.g., trainees) can learn the required workplace practices. Besides the lack of a theoretical sound and holistic framework, there is only little empirical evidence, too. The exploratory study at hand focuses on which kind of interaction trainees are involved in, how the trainees experience these interactions and how social interactions relate to learning. Fifty trainees of a German municipal utility company participated in the voluntary study. In order to gain insight into everyday social interaction in the workplace, the participants were requested to keep a semi-standardized diary aiming at the measurement of particular characteristics and emotional experience. During the diary period of ten workdays the trainees recorded n = 2,077 social interactions. First results point to the variety of possible sources and contents of social interaction. Regarding characteristics of the interactions, the trainees, on average, report a balanced speech proportion, a medium frequency of asked questions, very good atmosphere, and very low time pressure. Quite often, the interactions were of direct help, but they are rarely evaluated as to foster long-term learning outcomes. Unsurprisingly, the two variables are strongly correlated. Social interactions usually go along with positive emotions and motivation. The latter is correlated with questions, help, and learning reported for the respective interaction. Multivariate analyses focuses on differences between the interaction categories and the explanation of learning as dependent variable. Further results, practical implications, and methodological limitations will be discussed.

**Integrating multiple approaches within research programs on moral and democratic education**

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Research on moral and democratic education and citizenship education is particularly sensitive to systematic errors because social desirability and other biases are quite important and have repeatedly jeopardized the research. To overcome this problem, the use of multiple research approaches is appropriate, the idea being that each study has its strengths and its weaknesses and that using different approaches with different weaknesses permits to validate the research outcomes; this can be done within a single study. In the symposium, however, the focus is particularly on different approaches across studies within a research program (a concept related to convergent validity, but extended to research programs instead of single studies). The different presentations in this symposium aim at providing demonstrations for this. The first presentation (Patry et al.) provides a general meta-theoretical and methodological framework, using a specific example from a research program. Klaassen shows how the integration of different approaches can be done across studies and discusses problems that arise, while Pδï£üler et al. and Mortari and Mazzoni present single studies which must be seen within the network of the several studies being conducted within the respective programs. In all these studies qualitative and quantitative methods are related with each other within and particularly across studies, the main message being the necessity to do triangulation across studies in order to compensate for the respective systematic errors of the different approaches.

Multiple approaches in the study of responsible teaching through Values and Knowledge Education

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Multiple approaches are a mainstream topic which, however, is mostly reduced to qualitative versus quantitative assessments. We argue that multiple approaches are necessary on all levels of research, namely meta-theory, object theory, methods, and analysis but not in ethics. Theory is seen as the main objective of research; for this, an appropriate meta-theory is necessary. The best method cannot save a bad theory, and the best analysis cannot save a bad method. The research program on ‘VaKE’ (Values and Knowledge Education) is used to concretize the issues. VaKE is a didactical approach that permits to combine moral education and knowledge acquisition on a constructivist base; it has been the topic of a research program for more than ten years. VaKE is based on and related to several theories, thus providing an example of multiple approaches on the theoretical level. Its meta-theoretical underpinnings are postpositivism and non-naturalism; both are more complex than anticipated, involving multiple approaches. Further, an important meta-theoretical problem is the impossibility to conceive statements that are both general and concrete (generality-concreteness antinomy); this renders it necessary to have studies of different generalities and concretenesses within a research program. This is done in the research program on Vake by using multiple approaches on the methods level (designs, independent variables, dependent variables, samples, and settings). Finally, different types of analysis are used. The example of the impact of the
meta-theoretical generality-concreteness antinomy on the methods level demonstrates the relationship between the different levels. Implications for research and practice are discussed.

**Challenges of a marriage between qualitative and quantitative approaches in moral education research**

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This paper discusses some experiences in the domain of moral education research. It focuses on the moral task of teachers and the different ways this issue can be researched. The two research examples that are presented here intended to provide both a ‘policy’ oriented insight as well as a ‘practice’ oriented insight into the moral aspects of the role of the teacher. In our presentation we discuss some of the ambiguous epistemological characteristics and implications of a mixed-methods approach that tries to achieve both aims. In our paper we present the methodological aspects of the research designs of two projects that try to combine a quantitative and a qualitative approach (in that order). These research projects concentrate on two related aspects of the teachers’ moral professionality: the moral task of the teacher in the school and the moral upbringing of youngsters at home and at school. The aim of the paper and presentation is to review and interpret the specific characteristics, strengths and weaknesses, the complementary function and results of this mixed-methods approach in the field of moral education.

**Teachers’ ethos and global networked perspective-taking: The groundings for responsible teaching**

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One way to confront the contemporary challenges against humanity and human living conditions is building up appropriate attitudes through education. Formal education is a promising starting point for addressing these challenges in order to ensure sustainability. A positive attitude towards responsible teaching and sustainable learning as well as a social perspective-taking ability need to be part of teachers’ professional ethos. Both pre-service teachers’ ethos and their ability to take a Global Network Perspective are studied with respect to ‘water’ as one example of today’s global challenges. A slide-show with 16 photos depicting various issues related to water was distributed to 28 pre-service teachers who were asked to write a personal letter to the researchers commenting on the contents. The letters were content-analyzed with respect to the expressed responsibility towards issues of sustainability, which moral agent, if any, was mentioned in the letters, and level of perspective-taking addressing four cognitive and affective barriers which need to be overcome to reach a Global Network Perspective. The results revealed three different categories of expressing responsibility: ‘not responsible at all’ (60%), ‘responsible as a private person’ (30%), ‘responsible as a teacher’(10%). Mostly only moderate degrees of socio-moral agency were displayed, often including references to ‘everybody’’s duty to be more considerate about using natural resources. And only a minority of participants addressed all cognitive and affective barriers. The main focus of the
discussion is on the potentials of a qualitative, in comparison to the limitations of a quantitative, approach.

**Teaching moral responsibility through virtues**

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In a research program based on Plato’s ‘Protagoras’ and on Matthews concept of children as important partners in philosophical inquiry the researchers aimed at enhancing the children’s virtues. Several activities were conceived in order to work with children on essential questions (i.e. What is justice? What is generosity?), thus promoting the faculty of thinking, and to examine how children (8-10 years old) express their own judgment about vital issues. The question was what elements help the children to reflect. Twelve conversations with little structure were conducted with the whole class. These were transcribed and analysed to see whether and how the researchers sustain the children’s reflections. The analysis following a rigorous approach of content analysis permitted to identify some categories, which describe the researcher’s interventions that support the children’s reflections. The main result is that the adult needs to display a valid posture in order to explore and support children’s reasoning. Often, during the dialogue with the children the conversation did not follow the researcher’s path but went along the directions opened by the children. In the presentation a list of ‘main units’ (contextualized in the dialogues with children) will be presented in order to show the relevance of researcher’s interventions to support children’s reasoning. The discussion deals with the need for responsibility in teaching in order to promote children’s moral responsibility. The qualitative approach is suitable to achieve this task because it allows to interpret experience in an open perspective that considers the intrinsically richness of the experience.

**Social and Interactive Aspects of Learning and Instruction**

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Russia (Other)

Martin Kramer  
University of Helsinki  
Austria

Monica Lemos  
University of Helsinki  
Finland

Susanne Weber  
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The main goal of this symposium is to discuss school development in various educational contexts within the framework of Cultural-Historical Activity Theory (CHAT) (Vygotsky 1934/2001; Leontiev 1977; Engeström 1987). Previous collective efforts to use and develop CHAT in the context of school change have been made (Sannino, 2008). In order to continue and expand studies
in the field, an international group of researchers from Europe, Asia and Latin America, who represent a new generation of work in this area, have joined efforts to discuss key concepts of Activity Theory, such as contradictions, instruments and objects in different levels of education. In this scenario interventionist research is essential in order to transform educational realities. The study of Kramer investigates the explanatory potential of dialogue between Self-Determination Theory and CHAT in order to understand mechanisms of needs objectification in individual and collective activity in the practical context of school work. The research of Lemos shows how a CHAT framework is applied for systemic description and analysis of educational management concept formation at multilevel educational activity. The other two works, by Lin and by Lapshin and Safronova, implement CHAT and particular interventional techniques to develop activity of teachers’ teams in the way of agentive and productive actions. The symposium demonstrates the power of explanatory principles of CHAT and formative strategies of intervention in social interactions in school settings in different cultures and conditions.

Needs and Activity - on the concept of needs in Self-Determination Theory and Activity Theory

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The paper employs the concept of basic psychological needs to bring into dialogue Self-Determination Theory (SDT) and Cultural-Historical Activity Theory (CHAT). This dialogue serves the purpose of understanding the relationship of basic psychological needs with individual and collective activity and its objects. The analysis traces conceptualizations of basic psychological needs in the two theories. In both theories the concept of need is derived from a dialectical approach that spans the gap between the individual and society. Also in both theories, needs look for possible objects that may meet those needs in activity. The basic psychological needs in SDT will be compared with the notion of unobjectified needs in CHAT. To examine possible concrete implications of the theoretical dialogue between SDT and CHAT, the situation of teachers in the process of school reform is analyzed as an example of conflict between societal demands and personal basic psychological needs.

Collective Agency Formation for Changing Teacher Interaction in School

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The paper examines the social interaction of collective subject formation between teachers and administration in public school in the context of system crises. The research investigates the relationships between rising agency of a school team as a collective subject of educational activity and the concept formation of shared object of the school activity. The research is based on cultural-historical activity theory, developmental work research methodology of expansive learning, the triangle model of activity system and the formative intervention method ‘Change Laboratory’. The Russian education system is going through reform aimed at improving the quality of education and updating it to modern international trends. One of the external social challenges to practice is how to involve school collectives, teachers and administration into school development processes as genuine agents of the reform. The real danger of a traditional reforming approach ‘from above’ is that many teachers and school administrations might just formally respond to the new requirements. Our research was made in collaboration with the team of a particular Moscow school which has a
strong tradition of innovative pedagogy, but faced serious crisis concerning the implementation of new educational policies. During 2012, an ethnographical study of the current situation was conducted as a historical quest for changes in the school activity, in an interactive multisession process for a representative group of teachers and administrators on the re-conceptualization of their activity system by visualizing the inner contradictions and finding collective solutions. We study the collective agency development of teachers within their social interaction.

**Concept Formation of Educational Management**

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This paper aims at discussing the need and the process of the Concept of Educational Management in São Paulo Brazil. More specifically, it discusses an approach to school management from a Vygotskian tradition (1934), which implies that the production of shared meanings and motives is an essential aspect for the development of a creative-collaborative possibility for transforming schools. As theoretical background there are two main points that are basis for the discussion on need and concept formation in order to deepen the educational management discussion. Social-Historical-Cultural Activity Theory (Vygotsky, 1934/2001 Leontiev, 1979; Engeström 1987 and 1999) and Concept Formation (Engeström 2011 and 2012). Its methodological procedures involve description of network of activities (Engeström 1990) for school management and preparation for the joint integration of these activities and the analysis of the discussions involving concept formation. Main findings and contributions are related to construction of collective meanings for the concept of management. To conclude, the expected result of this paper is mainly related to need investigation through interviews, documents and meetings in which the participants discuss their roles as manager-educators and the concept of educational management closer to school demands.

**Exploring the potential of an interventional tool for school improvement**

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The research analyzes an interventional tool, a school-based workshop designed to facilitate professional learning community, in a policy program to improve school quality in Taiwan. By inquiring the condition, process and impact of the workshop through theoretical lenses, the research may refine the workshop design, discover potential needs and contribute to the theories of interventional tool design. The mode of Activity system and the concept of instrumentality developed from Cultural Historical Activity Theory are employed to analyze the interventional tool. The result reveals the function of cultural artifacts utilized in the workshop, the concept formation for school improvement in the process of the workshop, and the challenge emerged after the interventions. The research may provide a theoretical foundation to design workshop into an effective interventional tool. In addition, the research also points out a contribution to bridge the gap between school site and starting change laboratory in Taiwan context.

**Opportunities to learn and teaching strategies: a cross-cultural approach**

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International comparative studies provide data especially relevant to explore the links between instructional quality, educational opportunities to learn and students’ achievement in a broad variety of education systems. While IEA studies (TIMSS, PIRLS) traditionally encompass analyses of curriculum, instruction and opportunities to learn in their investigation, PISA (Programme for International Student Assessment) only recently included such measures in the students’ background questionnaires. Rich data are then available which allows for exploring in an international context several research questions related to opportunities to learn (Schmidt and Maier, 2009) and instructional quality as defined in the framework set up by Klieme, Pauli and Reuser (2009). - Do education systems show different profiles of instructional strategies? Are students more often offered challenging content and tasks in some education systems than in others? Within countries, can variations between schools and tracks be found? - Are some classroom teaching strategies more related to students’ proficiency and engagement in cognitive tasks within and between-countries? Which percentage of the between and the within country variance of achievement can be explained by opportunities-to-learn measures? Beyond the content, the symposium will also address methodological issues of cross-national generalizability of the OTL and instructional quality measures. Do the variables and scales show a satisfying, valid and stable factorial structure across countries (configural invariance)? Do the correlations between the instructional quality measures and achievement show a satisfying stability across countries (metric invariance)? Can the means of the variables be validly compared (scalar invariance)? Data from PISA, TIMSS and a European Study about teaching in primary schools will be used.

Teacher behavior and students’ outcomes: results of a European study

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This European study investigates the generic nature of teacher factors included in the dynamic model of educational effectiveness. The dynamic model refers to the following teacher factors which attempt to describe teachers’ instructional role: orientation, structuring, questioning, teaching-modelling, applications, management of time, teacher role in creating a learning environment, and classroom assessment. These factors do not refer only to one approach of teaching such as the direct and active teaching approach or the constructivist approach but cover at least partly the main approaches to learning and teaching. In each participating country (i.e., Belgium/Flanders, Cyprus, Germany, Greece, Ireland, and Slovenia), a sample of at least 50 primary schools was drawn and tests in mathematics and science were administered to all grade 4 students (n=10742) at the beginning and at the end of the school year 2010-2011. Students were also asked to complete a questionnaire measuring background variables and teacher behavior in classroom (i.e., teacher factors). By conducting both a multiple-group Structural Equation Modelling (SEM) analysis, a model was produced that refers to all teacher factors and shows that these can be explained by two overarching factors. The first overarching factor represents teacher ability to maximise the use of teaching time.
whereas the second overarching factor refers to the qualitative use of teaching time. Multilevel analyses revealed that teacher factors explain student achievement in mathematics and science. Implications for the development of Educational Effectiveness Research (EER) are drawn.

Cross-cultural differences in teaching strategies, opportunities-to-learn and achievement in reading

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Using the PISA 2009 data from 43 education systems, the present study aimed at exploring to what extent is reading achievement of 15 year-olds explained by variations in reading curriculum. Factorial analyses have been performed on the ‘reading for school’ (RFS) variables. Four factors were extracted; configural, metric and scalar invariance were checked for, showing that configural and metric invariance were met, whereas scalar invariance was not. Correlations in each country were then computed between the 4 RFS factors and reading achievement score. Finally, Multi-level analyses were used to estimate the school and student level variance in reading achievement explained in each country by the 4 RFS factors and the students’ socioeconomic and cultural background. Two of the factors (interpretation of literary texts and use of non-continuous texts) were positively related to reading achievement and one (use of functional texts) was negatively related to reading in most of the countries. Interestingly, the factor Traditional literature course was negatively linked with achievement in many countries, but positively related to reading in a number of Asian countries. The multilevel analyses showed that more than half of the between-school variance on average could be explained by the RFS factors (uniquely or jointly with background variables). The between-school variance explained by the RFS factors was larger in tracked educational systems, suggesting that curricular variations in the language courses linked to tracking might have an impact on reading even if reading is not usually taught as a specific subject to 15-year-olds students.

Links between students’ achievement and teacher support in different education systems

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Findings from the Programme for International Student Assessment (PISA) suggest cross-cultural differences in the role of teacher support for mathematics learning. The present contribution aims at
explaining these differences with characteristics of education systems. It is a secondary analysis of PISA 2003 data with a sample of 236,479 students in 8,836 schools in 32 education systems. We use a three-level ‘intercepts-and-slopes-as-outcomes-model’ to analyse cross-level moderating effects of the school structure and cultural value orientations on the school-level association of student achievement and teacher support. Results show that negative associations between both variables are mainly found in education systems where 15-year old students are grouped by ability into different tracks and where hierarchy as a cultural value orientation is only weakly supported. In contrast, in most tracked systems with a high acceptance of inequalities the association is positive, which also is the case in many comprehensive education systems. For educational policy this suggests that, in order to initiate changes in classroom teaching it may not be sufficient to introduce new practices in teacher education and professional development. Rather, school structures and cultural value orientations also need to be addressed and the whole system needs to be taken into account, because its characteristics interact with educational practice.

Cross-cultural Differences in Teaching Practices, Opportunity to Learn, and Achievement in Maths

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A large international sample of students was used to develop and validate a new measure of opportunity-to-learn in mathematics classrooms. Students were asked to indicate whether and how often they had seen certain kinds of tasks in their mathematics lessons and in previous assessments. Aggregated on the country level, an index was formed to indicate applied vs. pure orientation of mathematics teaching in the country. In addition, a classical indicator for opportunity-to-learn (content coverage) was applied, plus several scales describing teaching practices and generic features of teaching. All scales, especially the new task-based (rather than content-based) indicator for opportunity-to-learn, could be used to describe country-specific teaching cultures in mathematics. In addition, the index explains a significant part of the discrepancy between TIMSS and PISA achievement results on the country level.

Exploring new perspectives on models of student learning and motivation

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Over the last few decades, substantial research effort has been invested in exploring the ways in which students learn during higher education. This research stems from a variety of research traditions and has evolved in different directions. A large number of studies have been carried out in diverse areas, such as: cognitive aspects of learning; learning conceptions or beliefs about learning and teaching, specific learning strategies; aspects of self-regulation; metacognition and motivational aspects. A shared feature of many of these studies is the search for relationships between various aspects of learning and an attempt to arrive at integrative models of learning. As the grounding knowledge base in the different research traditions have all been developed at least two decades ago, there is a need for a critical reflection and discussion of theoretical components if the field is to continue to progress. In particular, as new developments have been demonstrated within the field of cognitive psychology, motivation psychology and educational sciences on the level of regulative aspects of learning, conceptions and motivation theoretical studies are needed to investigate the possibilities of integration of these advanced theoretical perspectives within more fine-grained models of learning patterns. In the proposed symposium, 4 different papers, representing 4 different theoretical viewpoints in this field will present a research case in point. The discussant will focus on the integrative theme of the work presented and aim to open discussion up to the role and potential of integrative research within the field.

Analysing change in students’ approaches to learning by using a multi-method approach

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In order to support high-quality learning outcomes of university students and to facilitate the development of academic expertise, it is important to understand factors that contribute to student learning and studying as well as to student engagement in learning. Research on student learning processes and outcomes requires the adoption of an integrative research approach in which different theoretical models of student learning and different methodological approaches are combined. This paper aims at exploring the nature of university students’ study profiles by using the student approaches to learning (SAL) as the starting point and by combining the SAL tradition with the theoretical model of academic engagement. Our main purpose is to analyse factors that contribute to change in the individual profiles in specific teaching-learning contexts. Participants of the present study were 31 Bachelor students representing four disciplines, namely biosciences, educational sciences, mathematics and theology. The students completed the ALSI (Entwistle & McCune, 2004) which contains scales measuring students’ approaches to learning and studying. In addition, the students were interviewed. The results showed that by combining the inventory and the interview
data it is possible to form a deep understanding of factors contributing to the individual study profiles and changes in these profiles in specific teaching-learning contexts. Integration of different theoretical models of student learning enhances the creation of a more coherent picture of the complex interaction between the student and his or her learning environment.

Achievement goals and approaches to studying: Evidence from adult learners in distance education

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Achievement goals predict learning in children and young adults, but it is unclear whether they apply to older adults and how they are related to approaches to studying. A postal survey examined achievement goals, approaches to studying and academic attainment in distance education. The Achievement Goals Questionnaire-Revised and the Approaches to Learning and Studying Inventory were given to 2,000 students, yielding 1,211 responses. The findings confirmed the 2 x 2 model of mastery-approach, mastery-avoidance, performance-approach and performance-avoidance goals in adult learners. Mastery goals were positively associated with deep and strategic approaches to studying but negatively associated with a surface approach. Performance goals showed only weak associations with approaches to studying. Performance-approach goals were positively related to attainment, performance-avoidance goals were negatively related to attainment, but mastery goals were not associated with attainment. The relationship between achievement goals and attainment was partly but not wholly mediated by approaches to studying.

How does lack of regulation develop? A comparison of two major models

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To our knowledge, no studies have explored the development of perceived lack of regulation although it is has proven to be distinct from perceived self-regulation and a significant predictor of scholastic achievement. It is argued that this understanding could be promoted by the literature on occupational and school burnout: Burnout is defined a chronic stress reaction resulting from a discrepancy between one’s resources and their own or others’ expectations for one’s success, and it traditionally understood as a syndrome involving three aspects: exhaustion, emotional detachment and inefficacy. Many investigators, however, have begun to unravel the developmental trajectory of
the three aspects in an occupational or school setting. The purpose of the present study was to compare these two major models. The sample consisted of 245 students selected on the basis of systematic sampling from a mid-size Finnish town, who twice filled in a survey in addition to which data on scholastic achievement were collected. Data were analysed within a structural equations framework. The findings indicated that both models fit the data, but the fit indices favoured the trajectory model. The significance of the study is that it reunites two distinct traditions of educational psychology: the burnout tradition and the patterns of student learning tradition: an ‘undirected’ learning pattern can be conceived as school burnout as its elements conform to the typical pattern of burnout. Additionally, the results indicate that the more modern conceptualization of thinking in terms of trajectories is indeed a promising development.

Unraveling student learning and motivation in higher education

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Research on student learning in higher education is widely spread and abundant. In general it has also been accepted that students’ motivation plays a prominent role for students’ learning processes. There has been however some discussion on how both concepts are related to each other. The question arises whether motivation and student learning are intertwined or can be separated. Participants in this study were 464 professional bachelor students enrolled in the teacher-training program (kindergarten, elementary and secondary education). The current study seems to indicate that a specific motivational profile does not pertain exclusively to specific learning strategies. However, the results also show, in line with prior research, that demotivation is detrimental for student learning and that autonomous motivation can enhance student learning.

Processes and Outcomes in Interest Research: A Panel

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This symposium is designed to allow exploration of the relation between processes and outcomes in interest research. This relation is often described as dynamic, although exactly what this means for theory and practice, and whether this differs from engagement, is not well understood. In order to allow participants to engage in discussion together with the moderator/discussant, each other, and members of the audience, the symposium is organized as a panel discussion. Presenters will each use findings from recent research to describe the role of interest in the learner’s engagement with activity, and the way in which the varying demands and/or expectations for performance of the activity affect interest, quality of engagement, and outcomes. The panelists’ research represents a wide-range of contexts (lab experimentation, classroom practice, out-of-school learning) with learners whose interest is more or less developed and performance demands that are more or less explicit. The moderator and discussant for the session will draw on her own recent work describing intersections between interest research and neuroscience to challenge the panelists and promote interaction with the audience.

Promoting reflection and meaning-making: The ICAN Intervention

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This study describes findings from study of the ICAN intervention that was developed to support learners to make connections to science skills and strategies. The intervention consists of the learners writing responses to open-ended ICAN probes as part of their lab work each day. Their responses are not evaluated by the instructor, but serve as records of present thinking that can be used to inform the organization of the instructor’s subsequent interactions with them. Participants were 10- to 12-year-old participants in an out-of-school biology workshop. Two types of control groups were employed: a group who received only inquiry-based instruction through a workshop, and a group who did not participate in a workshop. Findings indicate that those who received the intervention outperformed both of the control groups; and, those in the inquiry-only control group
made gains that those with no workshop did not make. In brief, participants who received the intervention were more likely than those who did not to: (a) consider the possibility that they could pursue science, (b) develop interest, and (c) recognize that they needed more information before they could assume that they knew ‘what happened’ in the problem story task. Findings point to the process of supporting learners to consolidate their own understanding as critical to the development of interest, and to the ICAN intervention as providing this type of support.

**Fostering interest development in science education: Relations between process and outcome**

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Fostering the development of individual interest is a major concern in education across learning communities and domains. In science education, this goal is embodied by the construct of scientific literacy, which highlights affective components especially in terms of interest in science and related topics. Research has broadly addressed this issue by providing descriptive accounts of students’ interest levels in science. This study extends this view by closely looking into the procedural dynamics between interest development and interest outcomes. A pre-post measure of individual interest and five in-between measures of situational interest were administered to a sample of 156 high school students during a three week problem-based intervention in the science classroom. Results indicate an overall pre-post gain in individual interest. Stimulation of situational interest varied as a function of different learning activities, and was shown to contribute incrementally to the prediction of interest outcomes above and beyond prediction afforded by pre-treatment individual interest. Implications for future research on interest development in science education as well as for K-12 classroom practice are discussed.

**Self-regulating interest and learning over time: Adding performance concerns**

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The Self-Regulation of Motivation (SRM) model suggests that both goals-defined motivation (i.e., value and expectancy of reaching goals), and experience-defined motivation (i.e., whether interested) are important for maintaining behavior, and that they can work sequentially over time by affecting patterns of engagement and outcomes. To examine this process, we previously created an online HTML lesson, modeled on lessons used in an online programming class. Initial results suggested that utility value information was associated with more manipulating and modeling of sample HTML codes in optional examples. This predicted greater interest at the end of the session; for about 20% of the sample, it also predicted failure to submit an assignment during the time allowed, suggesting a potential trade-off between creating interest and doing well. In the present study, we used the same paradigm but added explicit information at the outset that students would be tested and their scores compared to other students. Informing students about the evaluation was associated with greater expected difficulty and greater importance of doing well measured prior to engagement. Their interaction negatively predicted both the number of times students manipulated the examples during the lesson and interest reported at the end of the lesson, and the effect on interest was no longer significant when controlling for degree of example manipulation. This pattern suggests that evaluative concerns can result in less interest not simply by creating negative states, but by making students less likely to engage in actions that help to make the experience more interesting.

The role of cortisol trajectories in performance and interest development

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Hormonal processes can provide insight into motivational dynamics, and we consider the role of cortisol trajectories in interest development. Although the relation between the role of the stress hormone cortisol and negative effects of stress on memory and performance has been documented in many studies, the relation between cortisol and memory is not well understood. In the present study, cortisol levels during learning and performance were assessed, as well as the trajectory of cortisol growth, as a predictor of interest and task performance in a learning context. We stressed participants (or not) by creating socio-cognitive conflict and giving them a performance goal (‘try to perform better than others’), which defined competence normatively and emphasized comparisons to others. In another condition, we gave participants a mastery goal (‘try to learn as much as possible’), which we hypothesized would reduce situational pressure because mastery goals define competence in terms of learning and self-improvement and should therefore create a situation in which conflict might promote learning. Neither cortisol during learning nor cortisol during testing predicted interest or task performance, but trajectory of cortisol change over time was a significant predictor of both outcomes: Increasing cortisol growth over time led to less interest and worse performance, but flat or decreasing cortisol over time led to more interest and better performance. These results suggest that it is the dynamic relation between cortisol during learning and cortisol during performance that is most critical; consideration of cortisol trajectories helps to illuminate motivational processes in learning.

The Meta-Curriculum in Mathematics: An exploration of patterns, trends and practice internationally

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This symposium examines the feasibility of utilising the mathematics classroom for the realisation of a meta-curriculum that transcends conventional mathematical facts and procedures. The mathematics classroom has long been posited as a fertile site for the development of thinking skills. Mathematics curricula in different countries frame their goals differently, but each curriculum identifies some form of higher order thinking as important. The four presentations in this symposium take different approaches to researching the utilisation of the mathematics classroom to achieve the goals of this meta-curriculum. The first presentation (Xu & Clarke) reports the comparative analysis of mathematics curricula from Australia, China and Finland and of those curricular goals related to the promotion of mathematical thinking. The second presentation (Mesiti & Clarke) examines the actual instructional strategies employed by mathematics teachers in China, Japan, Sweden, Singapore, Australia and the U.S.A. to promote higher order thinking skills in their classrooms. In the third presentation (Gaussman & Clarke), teacher and student use of grammatical metaphors is employed as an analytical entry point to examine participation in vertical discourse in two primary and two secondary mathematics classrooms. Presentation Four (Aizikovitsh-Udi, Kuntze & Clarke) examines the interrelatedness of statistical and critical thinking and the use of the same tasks to promote the development of both in mathematics classrooms. In combination, these presentations report research documenting the diversity of forms taken by the meta-curriculum internationally and suggest strategies by which it might be more effectively implemented.

Locating the meta-curriculum

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In this study, we compared the intended curricula from Australia, China, and Finland, in an attempt to characterise how each curriculum was organized and particularly how mathematical thinking was intended to be integrated in the teaching of mathematics content. Using text analysis as the main method, we compared the curricular standards statements, adapting a two-dimension coding system developed by Andrew Porter and his colleagues. The results demonstrate differences in the ways that each curriculum was organized and the types of performance that each curriculum prioritized. Our primary interest in this paper is in those curricular objectives that transcend content and might be interpreted as constituting the meta-curriculum or the promotion of ‘mathematical thinking.’ By ‘mathematical thinking’ we mean forms of mathematical reasoning that transcend specific content areas or topics. In our particular coding scheme these were classified as: Mathematical Reasoning, Non-routine Problem Solving and Making Connections. Our analysis of the curricular statements associated with mathematical thinking showed that the Chinese Curriculum made use of sample mathematical tasks to exemplify both the meaning of a particular standard and how the associated mathematical performance might be promoted in the classroom. Student work samples in the
Australian Curriculum served to illustrate not only classroom tasks or practices, but also typical student performances that met a particular standard. In contrast, the Finnish Curriculum was stated in highly general terms with little elaboration and few examples. In each case, teachers were supported very differently in their interpretation of each curriculum document.

**An analysis of the promotion of higher order thinking across six countries**

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The promotion of higher order thinking skills, and the creation of the conditions that promote these, remain a challenge for classroom teachers of mathematics. In this study, we report efforts for the promotion of higher-order thinking in classrooms in six countries: China, Japan, Sweden, Singapore, Australia and the U.S.A. Use was made of data generated by the research design employed in the Learner’s Perspective Study (LPS) (Clarke, 2006) to study lesson sequences in geographically and culturally diverse classroom settings, where multi-camera video documentation of classroom practice was supplemented by post-lesson video-stimulated interviews with teacher and students. In each instance that was identified as an attempt to promote higher-order thinking, we were able to examine the tasks employed, and the mathematical action, and interpret and relate these to the creation of conditions for the promotion of higher-order thinking. A number of classroom events were found to create the following conditions that appeared essential for the promotion of higher order thinking.

- **The lesson goal (intention):** Our analysis of the teacher questionnaire responses revealed a common commitment by teachers to the development of higher order thinking skills.
- **The mathematical task (action):** We found that the mathematical tasks were carefully chosen to lead to a legitimate abstraction.
- **The modeling of critical reasoning and meta-cognition (disposition):** Particular student mathematical activity associated with student reflection and metacognition was highlighted by the teacher as desirable. Our analysis suggests that attention to these conditions contributed to the creation of a classroom environment that promoted higher-order thinking.

**The participation of primary and secondary school students in vertical discourse**

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Several studies suggest that the ability to use de-contextualized language is a prerequisite condition for educational success. Several research studies have documented a transition in the technicality of classroom discourse from primary to secondary school. These two statements suggest two general questions on which our research is based: . Can we confirm the transition of language that was found in other subject areas for the case of mathematics? . Are students in primary school unable to participate in vertical discourse? This paper reports analyses of the use of de-contextualized language in two primary and two secondary mathematics classrooms in Melbourne. The data used in this analysis were taken from an international study of curriculum alignment in Melbourne, Beijing and Helsinki and was analyzed to compare the character of discourse in the four classrooms with
specific attention to functional linguistics. Applying the concept of ‘Grammatical metaphor’, we compiled teacher and student lexicons to identify the use of de-contextualized language. Our results confirmed the transition of language from primary to secondary school mathematics as reported elsewhere. As a differentiation of that general tendency we could, however, detect a large disparity between the language used in the two primary school classrooms. One discourse was determined through the use of conversational mathematical language, whereas the other discourse could be classified as vertical and teacher and students participated in this vertical discourse. It appears that primary school students are capable of participating in vertical discourse. The implications for the realization of a meta-curriculum are significant.

**Implementing the Meta-Curriculum: Developing statistical and critical thinking skills**

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Dealing with statistical information requires critically reviewing evidence. Critical thinking consists of components like inductive reasoning, and questioning assertions and hypotheses. Even though statistical thinking and critical thinking appear to have strong links from a theoretical point of view, empirical research about the intersections and potential interrelatedness of these aspects of competence is scarce. Responding to this research need, this paper aims to identify how abilities in both areas may be interdependent. A preliminary and exploratory qualitative study has been undertaken into thinking processes when working on tasks from both areas. This paper reports a case study from one of the interviews. The provision of an empirical foundation for the connection between statistical thinking and critical thinking would advance the potential realization of the meta-curricular emphasis on higher-order thinking by raising the possibility that meta-curricular goals could be achieved through strategic use of appropriate domain-specific tasks. The tasks used in this exploratory study have certain distinctive characteristics: each uses a ‘real-world’ situation as its ‘figurative context’; each provides succinct statistical information relevant to that context; the problem is stated very simply; some form of evaluation is integral to the problem; the task affords many reasoning approaches. The exploratory study demonstrates that connections clearly exist between Statistical Thinking and Critical Thinking at the level of individual reasoning practices. We argue that suitable tasks can stimulate the use, promotion and development of both Statistical Thinking and Critical Thinking and thereby realize the goals of the meta-curriculum together with conventional content-oriented goals.

**Exploring associations between interpersonal regulation in group activity and learning outcomes**

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In the past decade researchers in the areas of metacognition and self-regulation have expanded their interests beyond the activity of individuals to the exploration of social and interpersonal regulatory phenomena and how it emerges in different learning contexts. So far most of the efforts have been directed towards reaching a working conceptualisation of interpersonal regulation, identifying suitable categories or descriptors of social forms of regulation, and characterising forms of interpersonal regulation associated with collaborative and task-oriented group functioning. Little is known, however, about the extent to which the presence of interpersonal regulatory behaviours is linked to learning outcomes. The aim of this symposium is to address this under-investigated issue by presenting four papers that focus on social regulatory processes and their links to student learning in different contexts. The studies part of this symposium are representative of the existing diversity in terms of research focus, are varied in context, involve participants of different ages, and use a wide range of methods showcasing current contributions and challenges in this area of research. From a theoretical perspective this symposium addresses an under-explored area of research within the social-regulation developing literature. From an educational perspective, the studies presented here have the potential to inform educational programmes and interventions at different levels.

**Relating social regulation of cognitive activity to learning outcomes: A new methodological approach**

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Interpersonal and social regulation in student-led collaborative learning has generated a swell of conceptual interest in the last decade, with a growing appreciation of the role of self and social aspects of regulation as complementary processes of learning. Alongside this increased interest is the attention given to the development of research methodologies that can provide reliable empirical evidence for these conceptual ideas. While methodologies for capturing and analysing the interactive and dynamic nature of social regulation as it unfolds are emerging, to date limited attention has been paid to the relationship between groups’ social regulatory processes and their learning outcomes. In this presentation, we will address this still under-investigated aspect of social regulation. First, we outline the theoretically driven methodology, and derived three-stage coding system we developed to identify the nature of cognitive engagement and social regulation processes in student-led collaborative learning activities. Second, we present how this methodological approach was validated through a study that compared the orientation and levels of cognitive engagement as well as social nature and function of metacognitive regulation processes of groups of students that differed markedly in their content understanding of the material being studied in collaboration. The data reveal major quantitative and qualitative differences in patterns of social regulation between the lower and higher performing groups as they collaborated on two learning tasks.
This study examines the role of regulatory processes within a multi-agent simulation environment. 17 medical residents participated in a critical care simulation training program designed to improve crisis resource management skills. Video and physiological data were collected during simulation and debriefing sessions. Questionnaires, evaluation checklists, and interviews were also collected to assess learning and performance. Results from the study provide insights into the role of cognitive, metacognitive, and affective processes for team decision-making. Findings will be discussed in terms of the implications for: 1) the design of critical care simulation training, 2) theories of self/co-regulated learning, and 3) the nature of learning processes within multi-agent environments.

The role of interpersonal interactions in emotional regulation in medical student learning
Learning to monitor and regulate one’s emotions in an academic setting is a task that all students must engage in. Successful emotional regulation can lead to better learning outcomes. This paper explores emotional regulation in medical education in the context of learning how to give bad news to patients. In particular, we examine the role that patient’s emotions play in influencing medical student’s emotional regulation and consequent learning about how best to communicate bad news. In this regard, we examine the social aspect of metacognition (Salonen, Vauras & Efklides, 2005) and examine how private cognitions are influenced by social experiences (Hacker & Bol, 2004). This paper defines and assesses emotional regulation in terms of what strategies medical students need to use to monitor and control emotions. It also provides a prototype for how technology can be used to foster monitoring skills in medical students so that they can better communicate with their patients and increase patient motivation and overall satisfaction during the disclosure of bad news. Enhancing emotional regulation can lead to more effective forms of physician-patient communication, which ultimately leads to better patient care.

Relationships between social regulation, dialogue, and learning outcomes in UK Year 1 children
This paper explores relationships between social forms of regulation, quality of group dialogue, and children's academic and metacognitive outcomes in a cohort of 30 Year 1 students in the UK (age 5-6). Ten groups of 3 mixed-gender and mixed-ability students were video recorded during 4 peer-led and problem-solving activities in the areas of Arts, Science, and Dialogic Skills. Activities took place in the course of 6 months. Preliminary findings indicate that episodes of shared-regulation (high degree of mutuality and reciprocity in regulatory exchanges) were relatively infrequent but increased in incidence in the course of the activities coinciding also with instances of exploratory talk (e.g.: provision of reasons; seeking understanding). Groups' incidence of joint exploratory talk and shared regulation was associated with conceptual and metacognitive gains, particularly for low-ability students. This paper aims to contribute to a relatively small body of research exploring associations between social forms of regulation and young children's learning at school.

Social inclusion in integrative settings—what can we do?

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The aim of inclusion consists not only in placing all children in mainstream classes but also in ameliorating social participation of persons with and without disabilities (Haeberlin, Bless, Moser, & Klaghofer, 1999; Huber, 2006). While the positive impact of inclusion on school achievement of pupils with and without disabilities was proved in several studies (Merz, 1982; Haeberlin et al., 1999; Myklebust, 2002; 2006; Tent et al., 1991), the current state of research regarding social integration is more complex to outline. Class placement alone cannot be seen as crucial to assure inclusive education. The first submitted presentation deals with the self-concept of 108 pupils with SEN in special education and inclusive settings and shows that pupils in integrative settings experience better emotional integration in their schools than the pupils from special schools. The second presentation describes a study with 179 pupils with and without SEN from integration classes and analyses the social inclusion in connection with social behavior. The third contribution analyzes loneliness among 108 students with ASD, motor and sensory disabilities. The relations between number of friends, friendship quality, social self-concept on the one hand and loneliness on the other are explored. The last presentation determines whether there is a link between social referencing processes and social integration in school and presents an experiment with teachers feedback. Afterwards the discussant will summarise the main results of all studies and discuss the importance of social inclusion and contracts which are close to this.

Social integration and social behavior of pupils with and without SEN in inclusive settings
Classroom placement alone cannot be seen as crucial factor influencing social participation of children in inclusive education. Social and emotional integration is mainly determined by other factors like social behavior and social competences. In the present study, social behavior according to self and teacher perceptions as well as social and emotional integration in class were analyzed in a sample of 179 pupils from integration classes in Graz, Austria. Comparisons between pupils with and without special education needs (SEN) illustrate that pupils with special education needs (SEN) showed more indirect aggressive behavior and less pro-social behavior than pupils without SEN. Regarding emotional integration, pupils with SEN felt as well integrated as pupils without SEN; nevertheless they felt less socially integrated. According to the results of this study, social and emotional integration are mainly determined by factors like social behavior and social competence. Implications of the results for teacher education and instructional settings will be discussed.

Self-concept of pupils with special educational needs in special education and inclusive settings

There is consensus among researchers that schooling in inclusive settings usually is advantageous in terms of academic achievement for both the pupils with special educational needs (SEN) and their
non-disabled classmates. However, it is still feared by some, and these fears are supported by the results of some empirical studies, that education in inclusive settings could adversely affect the self-concept of SEN pupils and their feelings of being socially accepted in class and emotionally integrated in school, because of the constantly unfavorable social comparisons with their non-disabled peers. Therefore, one could argue, in this respect it would be better to educate SEN children in special schools. In the present study, 108 pupils with SEN from grades 6 to 8 completed the questionnaire for the assessment of dimensions of integration (FDI 4-6) by Haeberlin et al. (1991) and the anxiety questionnaire for school children (AfS) by Wieczerkowski et al. (1981). All participants were taught according to the curriculum of ‘general special schools’. Half of them visited special schools and the other half were schooled in inclusive classes of regular secondary schools, both in the province of Lower Austria. The FDI and AfS test scores of pupils from special schools and of their counterparts from inclusive classes did not differ significantly. In contrast to the expectations, pupils from inclusive settings tended to report even better emotional integration in their schools than the pupils from special schools. These unexpected but encouraging results are discussed in the light of the relevant literature.

Loneliness among Students with Special Educational Needs in Mainstream Seventh Grade

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The goals of this study were twofold. The first aim was to compare loneliness prevalence in typically developing students, students with ASD and students with motor and/or sensory disabilities in mainstream 7th grade in Belgium. The second aim was to explore the relations between number of friends, friendship quality, social self-concept on the one hand and loneliness on the other for each of these three groups, and to compare them across groups. In this study, 108 students with special educational needs (SEN; i.e., 58 students with ASD and 50 students with motor and/or sensory disabilities) were matched to 108 typically developing classmates. Students with ASD reported more loneliness than typically developing students and students with motor and/or sensory disabilities. Loneliness prevalence for typically developing students and students with motor and/or sensory disabilities did not differ significantly. Factors related with loneliness differed between typically developing students and students with SEN (i.e., students with ASD and students with motor and/or sensory disabilities). For students with SEN, same-sex social self-concept was related with loneliness, but not, as for typically developing students, number of friends and opposite-sex social self-concept. Also friendship quality had a marginally significant effect on loneliness feelings for students with SEN. Implications for further research and practice are discussed.

How Teacher/s Feedback Could Influence Student/s Social Acceptance in School – an Experimental Study
The poor social acceptance of children with special educational needs is a core problem of the current inclusion debate. Based on the social referencing theory the study explores whether teachers feedback modifies the probands acceptance of schoolchildren at the same age. In an experimental research design the change of the social acceptance in course of different teacher feedbacks was assessed. The experiment is conducted on a computer. The sample consists of 150 participants (Grade 2). The sample is divided up into two study groups with different teacher types (fair teacher vs. unfair teacher) und consists of male and female participants in equal parts. Teacher’s fairness is expected to be a moderator variable for the link between teachers feedback and social acceptance. Thus the study follows a 2 (fairness) x 2 (sex) x 3 (feedback type) design with a repeated measure for the factor feedback type. Data of the main study are collected but not analyzed until yet. Data of a pilot study suggests that there is a significant main effect for the teacher feedback (F=36,5; df=2; p

Educational technology acceptance: Explaining non-significant intention-behaviour effects

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Sustainable technology-enhanced learning requires learners’ acceptance and use of educational technology. Current models basically describe educational technology acceptance (ETA) as use behaviour under the influence of use intentions. The approach has been criticised with respect to its unidimensionality, and to the intention-behaviour linkage that is insufficiently validated by empirical research. This symposium includes four case studies of technology-based learning environments from schools, universities and continuing education, each providing examples of non-significant intention-behaviour correlations. Subsequently, more in-depth analyses move from the initial unidimensional ETA model to more complex approaches. Study 1 points at students’ freedom of choosing the ‘what’ and ‘how’ of the learning process, and suggests that ETA models should include self-regulated learning criteria. Study 2 employs different operationalizations of technology use behaviour, from which only some were influenced by use intention. This calls for a higher methodological complexity of ETA models. Study 3 observes that educational technology was used in a community of practice, where alternative, technology-free help-seeking strategies were established as a habit of the learners. Study 4 regards technology use in schools from an ecological perspective and observes not only attitudes and engagement, but also the integration of technology-enhanced learning in curriculum, and the large-scale infrastructure change. As a common conclusion, the current, unidimensional acceptance approach is conceptually and methodologically insufficient to describe complex educational processes. An enlarged acceptance approach should include didactical and socio-cognitive factors, and aspects of educational management, in order to better explain the phenomenon and suggest interventions fostering ETA in educational practice.

Use intention and actual use behaviour of learning management systems in a TAM3-based framework
In the past years, the increasing number of implementations of learning management systems in educational institutions has aroused great interest on the study e-learning acceptance. Acceptance studies focus on the predictors of system use, and generally consider behavioural intention as a proxy for actual use. Recently, empirical research has questioned the influence of intention to use on actual use. This study proposes a TAM3-based model, with the inclusion of two additional variables: personal innovativeness and perceived interaction, to study the factors influencing learning management systems’ acceptance, with special focus on the relation between intention and actual behaviour. In order to do so, data has been gathered from a survey administrated to Spanish graduate students, and a partial least squares analysis has been used to test the research model. The results of the analysis supported the original TAM relations, except for the intention-behaviour linkage, and unveiled a dual nature of perceived usefulness, with one component related to efficiency and performance, and another component related to flexibility. The main findings from this study question the adequacy of applying the TAM3 model in educational settings when compared to simpler models. Moreover, behavioural intention to use learning management systems might be related to learning modality preference, and therefore its measurement scale might also be subject to further revision. A reformulation of behavioural intention addressing the particularities of educational contexts should cover aspects related to flexibility and self-directed learning.

Predicting teachers’ use of an educational system by intention, attitude and self-reported use

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Acceptance studies are for organizations a means to gain insight into users’ perceptions of a (newly introduced) technology. However, the validity of an acceptance study might be limited (a) in the case where a technology can be used receptively (e.g. to download information) as well as generatively (e.g. to share knowledge); and (b) if actual use of the technology is not measured. For this study, different dimensions of actual use of an educational portal (number of logins, downloads, uploads, reactions and pageviews) of 864 teachers were collected on two occasions (T1 and T2), and linked to their responses on an acceptance questionnaire based upon scales of TAM and TPB (taken at T1). Two research questions were put forward: (1) which dimensions of actual use can be predicted by attitude, intention and self-reported use; and (2) which factors discern the uploaders from the non-uploaders. Regression analyses showed that receptive use (logging in, downloading and browsing) could be predicted by attitude, intention and self-reported use, with variance explained ranging between .13 and .16; whereas generative use (uploading and reacting on contributions of other
teachers) could not be predicted (Adj. R2 between .01 and .04). Logistic regression showed that the more positive teachers’ attitudes towards the portal are and the higher their perceptions of control; the more likely they will upload information onto the portal. This study is a call for more research on the factors that influence different dimensions of actual educational technology use.

**Technology use intention, actual use behaviour, and help-seeking in a virtual community of practice**

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Increasing use of educational technologies calls for in-depth acceptance research. Most previous acceptance studies regard technology acceptance and use as unidimensional variables, and assume that technology adoption, while being a rational behaviour, is largely determined by use intention. However, corresponding empirical findings are methodologically questionable, which suggests that these assumptions oversimplify the phenomenon. The study at hand examines in depth the intention-behaviour correlation in the context of continuing education. The research setting comprises the use of educational technology supporting a virtual community of practice (vCoP) focused on human resources development. Firstly, three dimensions of use behaviour are extracted from log file data, preventing thus the inflation of the intention-behaviour correlation by common methods variance. However, no matter which operationalization of technology use behaviour was employed, the intention-behaviour correlation was found non-significant. Secondly, the lens on acceptance is enlarged with semi-structured interviews exploring the virtual community practice and focusing on users’ help-seeking strategies. Results indicate that although users intend to use the educational technology, in practice they prefer already established, alternative, technology-free help-seeking strategies. These have become a habit that is not easily displaced. In conclusion, educational technology acceptance research needs to be contextualized, taking into account specific practice goals and socio-cognitive activities such as help seeking strategies. Accordingly, technology acceptance theories and models should be further developed to describe technology acceptance in complex educational settings, such as in communities of practice.

**Ecological models explaining intention-behaviour disjunctions in ICT innovations in schools**

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The paper presents a reanalysis of data from the Impact09 project, a UK government-funded evaluation of technology use in nine high schools in England that had been selected as representing outstanding innovation and academic achievement. Impact09 sought to explore the ways in which
such schools were using digital technologies to support learning, and whether it was possible to generate interpretive hypotheses about why ICT came to have an impact on learning, at student, teacher and system levels. What the project reported was that traditional models of impact that addressed learning outcomes and assumed a steady trajectory of innovation failed to explain uneven patterns of adoption. Instead, an emphasis on learning practices rather than outcomes, interpreted within local and system-wide ecological contexts, better explained these adoption patterns. In the present paper, the reanalysis focuses on intentionality and teleology, and attempts to combine an ecological perspective with a critical analysis of the intention-behavior correlations among participants, particularly teachers and head teachers.

**Second Language Learning and Educational Success: Exploring the Role of Academic Language**

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Acquiring the language competencies needed for school success is considered to be a major obstacle for immigrant students (Bailey, Butler, LaFramenta & Ong, 2004). However, only little is known about the specific difficulties these students face when learning the language of instruction. Most importantly, very few empirical studies have explicitly focused on the concept of academic language and its role for educational achievement. Based on the assumption that proficiency in the language of instruction is an important precondition for academic success, this symposium presents current research on challenges in second language learning in pre-school and primary school. More specifically, factors affecting the development of second language skills in kindergarteners, such as the exposure to academic language and the size of the receptive-expressive gap, will be discussed. Concerning educational success at primary school, both early academic language skills and specific academic language features will be investigated as they relate to reading comprehension. In addition, we will address differential effects of language background and social background on academic language comprehension. The findings presented in the symposium will give new insights that are important to fostering language development in immigrant students and students from low-income families. Bailey, A. L., Butler, F. A., LaFramenta, C. & Ong, C. (2004). Towards the characterization of academic language in upper elementary science classrooms. Los Angeles, University of California: National Center for Research on Evaluation, Standards, and Student Testing (CRESST).

**Academic Language Proficiency of Children With Different Social and Migration Backgrounds**

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Cognitive academic language proficiencies (CALP) are characterized by a relative sophisticated vocabulary and complex sentence structure (Cummins, 1984). These competencies are considered to be a major challenge for children with migration background and from socially disadvantaged families. Furthermore, they are supposed to account for observed social disparities in school performance (Bailey et al., 2004). In two projects the performance of 8 year old children on grammar items, which draw on BICS or CALP respectively, were investigated. In addition, the impact of social disparities and academic language proficiency on differences in school performance was examined. Data from 407 German native second graders of various social backgrounds from the longitudinal project BiKS as well as data from 485 children with different migration backgrounds from the cross-sectional study BiSpra were analysed. Receptive grammar was measured by the TROG-D (Fox, 2006). The items of the test were divided into low and high difficulty (median split), assuming that the easier items are drawing on BICS and the difficult ones on CALP. To assess academic language comprehension on text level, a special listening-comprehension test was developed in BiKS. As hypothesized, highly significant interactions between social (1) and migration (2) background and sentence comprehension tasks demonstrate that children from socially disadvantaged families and children with migration background perform particularly poorly on more sophisticated grammar items but do not differ from other children on the more basic items. Further analyses show that academic language proficiency explains much more of the variance of school success than the social background.

Academic Language Features: Obstacles for Second Language Learners’ Reading Comprehension?

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Although the mastery of academic language is considered to be especially challenging for second language learners, only very few empirical studies have addressed the question whether second language learners are more strongly disadvantaged by academic language complexity than native speakers. Moreover, little is known about the role of specific academic language features for second language learners’ reading comprehension. Therefore, the aim of the present study was twofold: First, we investigated whether the effects of academic language features on reading comprehension are larger for German language learners (GLL) than for German native speakers (GNS) in general. Second, to find out which features are particularly challenging, differential effects of various academic language features on text difficulty for GNS and GLL were examined. Data were collected in a nation-wide reading comprehension assessment in German primary schools. Analyses are based on data of 1,141 third graders, 700 of whom were GNS and 441 were GLL. The academic language features of the ten continuous stimulus texts were rated in terms of criteria developed by the Center for Research on Evaluation, Standards, and Student Testing (CRESST; e.g., Bailey, 2007). We found that the majority of academic language features correlates substantially higher with text difficulty for GLL than for GNS. More specifically, for GLL but not for GNS, text difficulty is more closely linked with features associated with long and syntactically complex sentences.

**Effects of Academic Language Input on Literacy Development of Mono- and Bilingual Dutch Children**

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This paper examines the middle long-term impact of early academic language on Dutch, Moroccan-Dutch and Turkish-Dutch children's language development and reading achievement from first through third grade of primary school. Moreover, focusing on the Moroccan-Dutch and Turkish-Dutch children, the paper examines the role of academic language skills acquired in the first language for reading development in Dutch in primary school. Emergent academic language predicted first, second and third grade reading comprehension better than vocabulary, phonological awareness and letter knowledge. Phonological awareness and letter knowledge predicted first grade word decoding better. Moreover, academic language skills in L1 appeared to transfer to reading comprehension in L2, at least for the Turkish-Dutch students whose minority language has a literary and academic tradition.

**A Central Feature of Bilingual Language Development: The Receptive-Expressive Gap**

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The pronounced discrepancy between receptive and expressive language skills is an essential, yet rarely considered feature of bilingual language acquisition. In the present study, we investigated central characteristics of this receptive-expressive gap. We tested the language transfer hypothesis, which attributes the gap to differences in linguistic familiarity between the first and the second language, and the language exposure hypothesis, which associates the gap with different degrees of language contact opportunities. Furthermore, we examined longitudinally whether the size of the gap has an effect on language development. The sample consisted of 430 immigrant children (50% girls) with German as their second language at age 43 months and 112 children at age 60 months. The language skills were assessed with the standardized language development test SETK-2 (Grimm, 2000). Results showed that the receptive-expressive gap can be considered as a normative phenomenon that emerges in 92% of the children. The medium size of the gap was 0.97 SD. Our analyses support the language exposure hypothesis and showed that children with fewer contact to German-speaking adults and peers have a more pronounced gap. Longitudinal analyses revealed an accelerated language development in bilingual children with a small gap compared to children with a big gap. Knowing that bilingual children are struggling with language production, the question arises whether it would be appropriate placing greater emphasis on expressive language skills in language programs to promote language development.

Collaboration, Collaborative Learning, Professional Development

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Teams have become an important building block of organizations which are confronted with a fast-changing and complex environment. These challenges need to be tackled by people working together across boundaries of disciplines, functions, and cultures. The characteristics of these problems indicate that working and learning for these teams are closely intertwined. Individuals need to learn to be team members; teams need to learn how to structure themselves; and as the organizational context shifts, they need to be fluid enough to shift with them. This symposium brings together a range of papers that tackle timely issues in research on team learning: 1) team learning in diverse types of teams (from lab situations, to command-and-control teams; 2) team learning through time (time is included in the design of studies); 3) getting a grip on consequences of team learning (a range of operationalizations is offered in the studies); 4) Facilitating team learning (from supporting conditions to interventions). While the papers differ at the dimensions mentioned, they all have as a central focus team learning. This will be complemented by our discussant Sanna Jarvela, who will, based on her experience with research on issues of motivation and regulation in collaborative learning, confront these insights with different perspectives. This multiple confrontation will enable us to identify important lessons and pathways for future research.

Examining how group development stages relate to team-level learning behaviour

Eva Kyndt
Groups need to go through a series of development stages before they can operate effectively as a team. It has also been demonstrated that in a changing context, teams need to keep on learning in order to remain effective. This article aims to study the relationship between team development and team learning. Which development phases are characterised by basic team learning processes such as sharing information, co-construction and constructive conflict, and why? We hypothesise that, although each stage of group development is characterised by specific learning tasks, team-learning processes occur more in some stages than in others. Results from a model-based cluster analysis and ANOVA analyses on a sample of 44 professional teams (N_individuals = 168) show that teams learning occurs more in the trust and structure phase, and in the work phase, than in the two earlier phases of group development due to higher levels of team psychological safety and group potency.

**The relationship between team learning processes and products of work teams in organizations**

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Teamwork is of sustained importance in modern organizations. To develop the skills necessary for judgmental tasks, teams need to learn. Team learning encompasses processes and products, which are theoretically assumed to be reciprocally related (Kozlowski & Bell, 2008). The present study examines how processes and products of team learning are related and how team and organizational culture variables moderate these relations. Team learning processes are conceptualized as activities through which team members collectively share, reflect on, store and retrieve knowledge. On the side of team learning products, TMM on team member competencies and team performance are investigated. Included team culture variables focus on interpersonal bonds and structures between team members (e.g., safe team climate, Bauer & Mulder, 2011). Organizational culture variables focus on feedback culture. A cross-sectional study is conducted. Members of N = 31 professional work teams composed of 2-11 members (n = 130) filled out a questionnaire. Preliminary results indicate positive relations between team member ratings of team performance and the team learning processes knowledge sharing and team reflection. With respect to the included culture variables, results show that knowledge sharing is predicted by safe team climate, team reflection is predicted by safe team climate and organizational feedback culture colleagues. Further examination of the relations between processes and products of team learning is in progress. On the conference, we would like to present and discuss results of our study.
Improving performance in teams through team-level feedback and guided reflexivity

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Previous work has identified feedback as a powerful lever to improve performance. It is argued that teams need to process feedback in order to capitalize on it. We propose that team reflexivity grasps this feedback processing behavior. In a multiple-measures experiment 210 individuals were assigned to 105 two-person newly formed teams to complete a flight simulation task (four successive missions) under one of three conditions: a performance feedback group, a guided reflexivity and feedback condition, and a no feedback group. The results revealed that the combination of two components, feedback and reflective instructions, appears to be necessary to optimize feedback subsequent effect. This study suggests that team feedback should be designed in a form that stimulates teams to optimize an effective implementation of changes through reflection on task completion and teamwork.

Team Learning Behavior: A study in the setting of command and control teams

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Complex tasks, such as emergency management, are often executed by teams because they possess the varied knowledge and diversity in expertise that is necessary. The capability of integrating the knowledge available and agreeing on a common solution is crucial for team effectiveness, especially when teams face high risks and have limited time. Given the importance of knowledge sharing and construction in these teams, a team learning perspective can promote further understanding of the
socio-cognitive processes within command-and-control teams. Therefore, this study examined team learning behaviours and its effect on team performance and quality of decision-making in command-and-control teams. Data were collected from 19 teams involved in a simulation exercise. Performance and quality of decision-making was determined by multiple raters. Team learning behaviors were identified through video-coding of actual behavior. Results show positive relations between team learning behavior and team performance, moderated by constructive conflict. These results indicate the potential of a team learning perspective for understanding decision-making in these teams and has implications for training design for effective performance.

From the concept of ZPD to the practice of dynamic assessment

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The goal of the proposed symposium is to elaborate the relationships between Vygotsky’s concept of the Zone of Proximal Development and the current dynamic assessment (DA) practice. Though the notion of ZPD is often presented as a theoretical basis of DA, the theoretical scope of ZPD is much wider than a current practice of DA. Only some of the possible applications of the concept of ZPD have been realized in DA practice. The majority of DA studies focused on a narrow task of demonstrating that DA helps minority children and children with special needs to reveal their ‘hidden’ intellectual potential and targeted only such ‘pure’ cognitive functions as perception, attention, memory and reasoning. As a result some important areas of DA research and application remained neglected, among them the learning potential of high-functioning and gifted children and adults, and the DA in curricular and language-related areas. The proposed symposium will demonstrate the progress recently made in these previously neglected areas including the comparison of learning potential and IQ of gifted children, DA of speech and language, and a study of the range of learning potential in adults with identical cognitive performance. These new directions in DA research and practice promise to make the principles of DA more relevant for mainstream school education and adult vocational training.

The range of learning potential

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This presentation has two main goals: 1) To provide theoretical introduction to the entire symposium by examining the relationships between Vygotsky’s concept of the Zone of Proximal Development (ZPD) and the practice of dynamic assessment (DA); 2) To present a study that explored the range of learning potential in learners who have identical standard cognitive performance scores. Though the
notion of ZPD is often invoked as a theoretical basis of DA, ZPD has a much wider scope than the current DA practice. Vygotsky used the concept of ZPD in three different contexts: developmental, educational, and related to assessment. Only some of the possible applications of the concept of ZPD have been realized in DA practice. The majority of DA studies focused on a narrow task of demonstrating that DA helps minority children and children with special needs to reveal their ‘hidden’ potential. As a result some important areas of DA research and application remained neglected, particularly learning potential of adult learners and children with typical development. Young adults with identical cognitive performance scores in Raven matrices test demonstrated very different learning potential as revealed in the similar DA test. It is argued that DA allows for a better identification of typically developing adults with higher learning potential.

Dynamic Assessment of Language

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The present paper describes ways in which the dynamic assessment (DA) of language skills elucidates the ZPD of typically developing children, and those with language impairments. DA of language has been shown to assess both knowledge of language and more domain general skills of problem solving. In this way they have been used to gain detailed information about individuals with language impairments, and contribute to recommendations for intervention programmes, as well as to differentiate between those with language impairments and those who perform poorly on standardised tests for reasons of cultural and/or linguistic difference. The Dynamic Assessment of Sentence Structure (DASS) (Hasson, Dodd and Botting 2012) employs a sentence formulation task that is administered according to a procedure that combines elements of mediated learning intervention and a graduated prompting format. The graded prompts may be quantified resulting in a score that is comparable between participants, and represents a comparative measure of the ZPD of the individual. A brief description of the task and scoring mechanism will be presented along with case examples illustrating the assessment of ZPD.

Dynamic Assessment of Vocabulary

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Typically developing children’s are able to learn new words through limited exposure, in naturalistic interactions with adults and peers (this is referred to as ‘fast mapping’). However, different children demonstrate different levels of ability at doing this and children with language impairments demonstrate particular difficulty with learning new words, needing additional exposures and/or support in order to learn new words. In this context, the child’s vocabulary skills can be assessed both by looking at their vocabulary knowledge (words they already know) but also by looking at their ability to learn new words. The latter would equate to their ‘zone of proximal development’ (ZPD) in the area of vocabulary skills. Given that this ability varies across children, as well as across time (within a particular child), an estimate of knowledge without an estimate of ZPD would represent an incomplete picture of the child’s vocabulary skills. The paper will present two dynamic assessment methods that have been developed for assessing children’s word learning skills. Both methods have been used with a group of typically developing children to offer the opportunity of directly comparing children’s responses to the two graduated word learning opportunities. The paper will present the two methods adopted and explore the extent in which these methods reveal children’s ZPD.
Learning Potential and IQ Stability in Gifted Children

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Traditionally dynamic assessment (DA) focused on revealing the learning potential of children who had poor cognitive performance. Very little research has been done on the learning potential of gifted students. Some studies (e.g. Lidz & Macrine, 2001), however, showed that DA can be effective in identifying potentially gifted minority students whose abilities otherwise remain undetected. There are two assumptions that underlie our study: 1) We define children as gifted if they obtain the highest gain in the DA irrespective of their IQ; 2) Children’s learning potential is defined as a global gain in several DA tests. In our previous study (Calero, García-Martin & Robles, 2011), we were able to demonstrate that while high-IQ children showed greater gains in all DA tests than average-IQ children, within the high-IQ group itself the level of IQ was not predictive of the child’s learning potential. In the present paper we continue this research via a two-year longitudinal study that examined IQ and the learning potential of gifted children. The study included 49 children, 19 girls and 30 boys (aged 5 to 8), with an IQ between 134 and 159, (M=144.89; S.D. = 6.28). Children were initially assessed with three DA tests, a working memory test, and an intelligence test, and re-evaluated two years later with the same battery of tests. The results demonstrate the stability of the children’s learning potential and the capacity of DA to predict the maintenance of IQ.

Scaffolding and optimizing science instruction throughout the years.

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Children are naturally inclined to explore the world around them. In scientific discovery learning, children move from intuitive, implicit, context-bound domain-specific knowledge representations as initial state towards formal, explicit, context-free, domain-general knowledge representations (see Bransford, Brown & Cocking, 2000). Science education can be seen as discursive practice in the classroom with students being induced into representations of new phenomena (Nagy & Townsend, 2012). Argumentation, articulation and communication of understandings, giving and receiving feedback can all be seen as examples of the crucial role of (academic) language in science classroom practices. In the present symposium, we explore science education practices for children from 4 to 14 years, with a focus on different scaffolding techniques to advance their learning. Paper 1 focuses on the teacher, and on different styles in asking questions (retrospective vs. cued elicitation; the use of open-ended questions). Paper 2 focuses on preschoolers and kindergartners, and explores how individual cognitive and linguistic differences explain grasping the control of variables concept in a dynamic assessment setting. Paper 3 compares implicit versus explicit instruction in scientific
discovery learning in 4th and 6th grade children, also taking cognitive and linguistic differences between children into account. Paper 4 explores ways to optimize science education in 10th graders by comparing different types of timed feedback. The discussant is an expert on informal science education and, in that context, studies relationships between learners, mediators, and environments, and experiences.

**The quality of interaction in science & technology learning activities**

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The way the teacher intervenes during the interaction forms a fundamental part of powerful learning environments. Laevers et al. (2011) distinguish three dimensions in this ‘teacher style’: ‘stimulation’, ‘giving autonomy’ and ‘sensitivity’. In this research the connection between teacher style and student attitudes towards science and technology was analyzed. It was expected that a higher score on the three dimensions of teacher style would have a positive influence on the student attitudes for science and technology. Of two of the three dimensions (sensitivity and stimulation) we found a positive relation with the gender attitudes of the students concerning science and technology. Based on this research, a more advanced design for a second study has been developed in which the assessment of the process variable involvement will be inserted and a more detailed analysis of the intervention during its implementation will be conducted.

**Individual Variation in the Processes of Scientific Discovery Learning in Kindergarten**

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During kindergarten, children show important transitions in various scientific domains, in which they often go from a more implicit awareness of e.g. physical phenomena, to a more explicit awareness. An underlying ability in scientific discovery learning is the control of variables (Chen & Klahr, 1999). Young children may find it difficult to design experiments on representational changes in physical settings because of a tendency to change multiple things at once and thus making it hard to decide which change caused the effect. In an attempt to find optimal conditions for scientific discovery learning in kindergarten, we investigated the ability to grasp this control of variables strategy in young children in a dynamic assessment setting. These abilities were related to their home-environment, perception-action abilities, language abilities (vocabulary, syntax), working memory (phonological loop, visuo-spatial memory; executive functions), and reasoning abilities (inductive and deductive reasoning). Participants were 60 children in preschool and kindergarten between 4 and 6
years of age. Results evidenced differential roles for both cognitive and linguistic factors to explain the range in the ability to control variables.

**Acquiring control of variables in 4th and 6th graders: child factors and instruction types**

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Learning to vary the variable of interest and keep other variables constant, i.e., applying the Control of Variables Strategy (CVS), is a basic understanding children need to design unconfounded experiments. We examined if CVS is best acquired through explicit instruction or discovery-based learning in different grades and if learning gains can be predicted from child factors. Seventy-six fourth graders and 43 sixth graders participated. First, cognitive, linguistic and scientific skills were assessed. Next, one group received explicit CVS instruction whereas the other group was encouraged to design their own experiments in discovery-based manner. Before and after the intervention, task-specific and general CVS knowledge were assessed. The explicit instruction group showed highest learning gains on both task-specific and general CVS knowledge. Fourth graders showed higher learning gains in the task-specific CVS measure whereas sixth graders performed better on the general CVS measure. Variation in task-specific learning gains was explained by syllogistic reasoning skills in the discovery-based learning group. Differences in general CVS knowledge were explained by vocabulary measures in both groups, and by reading fluency and comprehension in the discovery-based learning group. The findings provide more evidence that explicit instruction is most effective to acquire CVS. However, when assessing CVS knowledge in different contexts more emphasis should lie on possible contributions of child factors.

**Comparing effects of two Delayed Retrieval methods in 10th grade biology classes**

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We compared the effects of two brief daily delayed retrieval interventions for high school biology students: a Diagram-based retrieval (DBR) warm-up and a Text-based retrieval (TBR) warm-up. Warm-ups were completed by 128 consented students in 15 classes over a 4-week period. Participants were pretested on knowledge, diagram comprehension, and spatial abilities, and randomly assigned to treatment within classrooms. Exercises included literal and inferential
questions about content covered 2 days to 2 weeks prior to each warm-up. Warm-ups from the two treatments tapped concepts from the students’ textbook: one instructed students about how to comprehend the diagram, the other focused on textual content. Students received feedback on their answers each week. Results showed equal growth from pre- to posttest for DBR and TBR in biology background knowledge, biology diagram comprehension (near transfer), and geology diagram comprehension (far transfer). Effects on geology diagram comprehension showed interactions with prior knowledge and paper folding test (PFT) scores for the DBR treatment only. Students with lower biology knowledge and lower PFT scores were disadvantaged in the DBR treatment, whereas the TBR treatment was beneficial across all levels of knowledge and spatial ability. We have shown that brief delayed retrieval interventions can lead to significant biology learning and increased diagram comprehension, but the diagrams-based intervention draws more strongly on biology knowledge and spatial visualization than does the verbal intervention.

**Antecedents and Consequences of Teacher Responsibility**

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Consistent with the theme of the 15th Biennial EARLI conference--‘Responsible Teaching and Sustainable Learning’--this symposium examines critical antecedents and consequences of teacher responsibility. In the context of strong emphasis placed on educational accountability, especially in Western countries, teacher responsibility constitutes an increasingly important yet understudied area of research. Building on a recently proposed conceptual framework (Author1 & Author2, 2011), presenters will report research on teacher responsibility conducted in four different countries (U.S., Italy, Switzerland, and Germany) and a diverse set of educational settings (K-12 regular and charter school teachers in the U.S., Italian high school teachers, Swiss vocational teachers, and German and Swiss university teachers). Both quantitative (Papers 1-4) and qualitative (Paper 4) analytical approaches are employed to examine the implications of teacher responsibility for such important outcomes as teacher emotions (Paper 1), work engagement, and burnout (Paper 2), endorsement of classroom practices (Papers 2 & 3), and conceptualizations of teachers’ professional roles as instructors (Paper 4), as well as the effects of such critical antecedents as motives for teaching (Paper 3) and school climate (Paper 2). Collectively, the research increases our understanding of how teachers conceptualize their professional responsibility, the factors that shape their sense of responsibility, and the implications of teacher responsibility for their well-being and approaches to instruction. The symposium discussant Ruth Butler, one of the leading experts on teacher motivation, will provide a critical analysis of the presentations.

**Teacher Responsibility and Teacher Emotions in the U.S.**

Fani Lauermann
The links between teachers’ sense of responsibility for four critical educational outcomes (e.g., student motivation), teachers’ perceived classroom problems (e.g., lack of student motivation) and teaching-related emotions (e.g., excitement and worry) were examined in a national sample of U.S. teachers (Study 1; n = 487) and a sample of charter school teachers in a Midwestern U.S. state (Study 2; n = 375). In both studies, higher levels of teachers’ sense of personal responsibility were related to higher levels of energy and excitement about teaching, even when teachers perceived their classrooms as problematic. Study 1 also indicated that teacher responsibility may have not only positive but also negative implications for teachers’ emotions, such as increased tension and worry. However, Study 2 did not find these negative emotion effects of responsibility, which is consistent with prior evidence that charter school teachers tend to report not only greater accountability for their students’ education, but also greater job satisfaction compared to regular public school teachers. Such evidence supports the need for research on how schools’ organizational contexts may moderate the emotional consequences of teacher responsibility. Results of both studies expand our understanding of the emotional consequences of teacher responsibility.

Teacher Responsibility and Its Correlates in a Sample of Italian High-school Teachers

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Over the past twenty years in the great majority of Western countries new responsibilities have been assigned to teachers as a result of education policies based on school autonomy and decentralisation. As a consequence, increasing attention has been placed on the relationship between education policies and teachers’ changing professional roles, including their formal level of accountability. However, little is known about teachers’ sense of personal responsibility and its psychological determinants and correlates. Previous research has suggested the need for a multidimensional approach to capture the complexity of teachers’ responsibility. The present study explored the relations between context variables (i.e., school climate), teachers’ personal beliefs (i.e., implicit theories of intelligence, self-efficacy), beliefs about their professional responsibilities, and outcome variables in terms of burnout, work engagement, and educational practices. Results from an ongoing study of Italian high school teachers revealed that, consistent with prior research, teachers’ perceived personal responsibility for negative educational outcomes is significantly correlated with their mastery approach to instruction, career choice satisfaction and with teachers’ work engagement, which in turn appears correlated with a positive school climate. Theoretical and practical implications will be discussed.

Vocational Teachers’ Motivation, Responsibility, and Self-reported Classroom

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Teachers’ classroom management practices are a critical predictor of student motivation. Hence, an important question concerns the factors that bring teachers to endorse certain classroom management practices. Research has shown that teachers’ practices can be predicted by their motives to choose teaching as a career and their sense of professional responsibility. This study examined the links between teachers’ motives for teaching, teachers’ sense of responsibility, and their approach to instruction for Vocational Education and Training (VET) teachers, a population in which these constructs have yet to be explored. An adapted version of the FIT-Choice scale (Watt & Richardson, 2007), a translated version of the Teacher Responsibility Scale (Author1 & Author2, in press), and a vignette instrument inspired by the Problems in School Questionnaire (Deci et al., 1981) were administered to 154 in-service VET teachers. Consistent with prior research, a path analysis indicated that social utility value for teaching was the most consistent predictor of teacher responsibility for students’ academic and interpersonal outcomes. However, intrinsic value was the key motive predicting responsibility for teaching, which in turn predicted teachers’ endorsement of desirable classroom management practices. The more VET teachers felt responsible for the quality of their teaching, the more they tended to endorse such favorable classroom management practices as autonomy-support and structure. As intrinsic value predicted responsibility for quality of teaching, it also indirectly predicted desirable instructional practices. Implications for teacher education and research will be discussed.

Early Career University Teachers’ Responsibility for Teaching

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The topic of teachers’ sense of responsibility has gained increased attention in recent years, with research focusing on such questions as whether and how teachers’ sense of personal responsibility is connected to their perceived self-efficacy and emotions (e.g., Author1 & Author2, 2010; 2012). However, this research has been limited to school teachers and thus little is known about how university instructors conceptualize their professional responsibility for teaching. University teachers may define their responsibilities differently, since their professional roles typically incorporate not only teaching but also research and related professional obligations that may result in conflicting goals and time commitments. Furthermore, in contrast to school teachers, university teachers did not specifically choose teaching as a career. This study focuses specifically on early career university teachers (ECUTs; university instructors in the first five years of their careers). A mixed-methods design was employed to examine German and Swiss ECUTs’ beliefs about their professional responsibilities with regard to their role as a teacher. Results show that ECUTs feel primarily responsible for their teaching and their relationships with students, but feel less responsible for their students’ motivation and achievement. Qualitative data analyses complement these findings, and indicate that ECUTs feel that their main responsibility consists of teaching-related activities.
(preparing lessons, transferring knowledge) and establishing positive relationships with students (incl. mentoring), but not of taking responsibility for students’ academic outcomes.

**Reseaching Extended Spaces of Learning in Formal Education: A Nordic Perspective**

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A persistent problem identified in development efforts within formal education is that its learning practices stay unconnected to student’s out-of-school experiences and knowledge funds embedded in local communities. Moreover, learning is often reduced to acquisition of knowledge and skills, and students’ agency and identities are not adequately fostered. Nonetheless, notwithstanding all efforts, little is known about how these problems can be overcome in situated practices of everyday formal education. The aim of this symposium is to illuminate students’ learning practices embedded in extended spaces of learning in formal education. As pedagogical designs, extended spaces of learning aim to create permeable boundaries between formal and informal learning practices and harness the potential of these hybrid spaces for educational purposes. The symposium contributions, emerging from a Nordic tradition of connecting formal and informal learning, explore extended spaces of learning in four innovative learning projects taking place in Finland, Sweden, and Norway. All papers utilize socio-cultural conceptual frameworks. First, Kumpulainen and Mikkola analyze novel space-time configurations emerging in a virtual creative collaborative writing project. Second, Lantz-Anderson, Vigmo and Bowen examine how students frame formal language learning activities in Facebook. The third and fourth paper of Kangas, Vesterinen, Krofkors, Lipponen and Kumpulainen, and Gilje and Erstad explore the implications of extended learning spaces for students’ agency in a school gardening project and in an entrepreneurship education program. Taken together, these contributions highlight the potential, and the challenges, extended learning spaces hold for fostering students’ learning, agency, and identity work in educational settings.

**Technology-Mediated Learning Practices in an Elementary School Community: A Chronotopic Analysis**

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This socioculturally informed study examines space-time configurations of technology-mediated learning practices in a Finnish elementary school over a yearlong musical project. The study focuses on the social practices of 21 students who worked with laptops, wireless Internet access, and a collaborative writing service at school and outside to collaborate on creating a school musical script. The findings illuminate a novel chronotope characterized by ubiquitous, multimodal, and multidimensional technology-mediated learning practices. These blended practices appeared to break away from traditional learning practices, allowing learners to navigate in different time zones, spaces, and places situated in the students' formal and informal lives.

**New spaces for learning - language learning practices in social networking sites**

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The amount of time that especially young people spend on communicative activities in social media is rapidly increasing. We are facing new spaces with great potential for learning in general and for language learning in particular but their impact on learning is not yet acknowledged as such in educational practice. The aim of this case study is to scrutinize how social networking sites (SNSs) serve as extended spaces for learning when implemented in school practices. The focus is mainly on how students frame the activities in such extended spaces for learning, to scrutinize the implications for their language learning and how they learn to communicate in culturally relevant and productive ways. By applying a socio-cultural-historical theoretical view of communication this study reports findings from ethnographic data of a Facebook group in formal English learning contexts with students aged between 13, 16 years old comprising one school class in Colombia, Finland, Sweden and Taiwan, respectively. The results indicate that social networking sites open up for possibilities to establish extended spaces of learning in formal education where students can practice and learn to use English in productive ways. However, the naturally occurring linguistic communication at times become unorganised and rudimentary and the interactions have to be deliberately and dynamically negotiated by educators and students to form a new language-learning arena with its own potentials and constraints.

**Agency in an Extended Learning Environment: Students Acting Accountably in a Gardening Project**

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This paper explores students' agency in out-of-classroom setting in a Finnish elementary school and focuses on a gardening project participated by eight, fifth-grade students. The school has a long history of participatory pedagogy and extending its learning environments. In our analysis we focused on accountable aspects of students’ agency when they worked in the garden plot. The findings suggest that acting accountable emerged in students’ talk and actions. In addition, accountability manifested as mutual responsibility and collective decision making. The results illuminate the ways in which participatory pedagogy can foster students’ agency through accountability in extended learning environments.

**Tracing Learning Trajectories: Agency among Students in Entrepreneurship Education**

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This research study, as part of a large-scale ethnographic fieldwork in a community in Oslo (‘Local literacies and community spaces’, 2009-2013), examines students’ learning trajectories in entrepreneurship education. The study reported on here explores how agency is performed by the students by means of taking responsibility in their joint project all the way to the Norwegian championship in Young Entrepreneurship. Following the students in this project over five months, we are able to identify how they perform their identity as learners, analysing how agency is put to the front. By applying a sociocultural perspective on the social practices of five upper secondary students in the project, we are able to trace their learning trajectories in making a specific product; an environmental friendly shim paper for sandwiches and a stand for exhibition. We do this by analyzing the interaction of the learners around designing a product as part of the entrepreneurship education, and their participation in two competitions. The findings illustrate how the learners’ agency relates to boundary crossings in the project as well as the two specific artifacts that link between contexts. With a strong emphasis in policy documents on entrepreneurship education across Europe as well as in the US, this study show the importance of untangling how students’ agency is related to their boundary crossing in such projects.

**Dealing with Diversity in Ethnically Heterogeneous Schools in Germany and Switzerland**

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Ethnic diversity is increasing in schools in Germany and Switzerland as in many other European countries. Yet, schools are often ill prepared for this increasing heterogeneity amongst their students. For many years, assimilation has been the strategy which was favoured by education authorities as well as society at large, followed by separation for those who would not assimilate. Only in recent years, there has been an increasing awareness that the society as well as the students have become multicultural and that these diverse cultures will have to be acknowledged and integrated in the school life and curricula. In this symposium, we will present results from qualitative and quantitative research in the area of multicultural education, studying its effect on a range of outcomes. Study 1, 2 and 3 focus on the acculturation of immigrant children and how this may be affected by acculturation expectations and a diversity friendly school climate (study 1 and 2) as well as courses in the language and culture of origin (LCO; study 3). Study 4 on the other hand examines the effect of multicultural English language classes on immigrant and non-immigrant students’ intercultural competence. Acknowledging that explicit and implicit learning both affect the transmission of intergroup attitudes at school, the first two studies deal with the implicit experience of an intercultural climate, whereas the last two studies are concerned with effects of more explicit measures that are part of a multicultural curriculum.

Acculturation Strategies of Immigrant Youth and their Impact on School Success

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This research project is situated at the interface of cross-cultural psychology and educational research on multicultural schools. It focuses on the relationship between the acculturation strategies of immigrant students, their psychosocial adaptation and their school success. In our study we developed a three-dimensional concept of acculturation including minority orientation, mainstream orientation and multicultural orientation. In this paper selected key results dealing with the following research questions will be presented: what impact do different acculturation strategies of immigrant youth have on their psychosocial adaptation and school success? And what impact do different aspects of school socialisation have on the psychosocial adaptation and school success of immigrant youth? The sample consists of secondary school students (n=1488) including immigrant (n=1124) and native-born students (n=364) who live in urban areas of German-speaking Switzerland. For the data collection a student questionnaire, a teacher questionnaire and a German reading test were administered. The data were analyzed by means of multilevel regression models. Preliminary results based on the full sample indicate that each of the three strategies examined in this study has a
positive impact on certain aspects of psychosocial adaptation. Regarding school adjustment and school success only multicultural and mainstream orientation were important positive predictors. Within a school system which fosters assimilation to the dominant culture, students with a minority orientation might not share the same benefits for school adjustment. Among the school variables a good teacher-student- and student-student relationship turned out to be important positive predictors of a better psychosocial adaptation and higher school satisfaction.

Diversity Climate and Immigrant Children’s Acculturation and School Adjustment

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Children with a migration background lagging behind their national age mates in education is a problem in Germany, like in many Western countries. Looking for remedies for the problem, more and more attention is given to the school context as providing valuable opportunities for intervention, as well as psychological variables underlying actual performance. The present study investigates the effect of school climate on immigrant children’s acculturation orientations and psychological school adjustment. In particular, climate aspects that are relevant to intergroup relations in the class and dealing with ethnic diversity are considered. Analyses were based on a cross-sectional sample of 996 children with a migration background who attend German secondary schools. Cross-sectional analyses as well as analyses of change over the course of one year confirmed, that a diversity friendly climate had a positive effect on children’ psychological school adjustment, which was mediated by their acculturation orientations. Implications for school development are discussed.

Acculturation & Identity of Immigrant Youth: The Impact of Courses in Language & Culture of Origin

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The concept of intercultural education in German-speaking European countries promotes the inclusion of courses in the language and culture of origin (LCO) for immigrant youth into the school curriculum of host countries. Such courses are assumed to have positive effects on the development of immigrant youth in the host country. Particularly, it has been suggested that participation in LCO-courses increases immigrant youth’s self-esteem, facilitates the development of their bicultural identity and improves their integration in the host society. However, there is a lack of empirical evidence on the nature of the effects of LCO-course attendance on immigrant youth’s acculturation and their cultural identity. Accordingly, the aim of this study is to examine the impact of immigrant
youth’s attitudes towards LCO-courses and of their attendance of such courses on their acculturation and cultural identity.

Effects of Intercultural Instruction in Foreign Language Classes

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The fostering of intercultural competence is an important goal in schools, but we still have little empirical evidence about what kind of instruction is helpful. This paper aims to answer the question, which observable aspects of instruction lead to a promotion of intercultural learning in the ESL class. The study operationalizes intercultural competence as complexity in the subjective construction of intercultural differences and is based on the reanalysis of video data (n=90) and corresponding student (n=2.390; with 20% of the students being first or second generation immigrants) and teacher data derived from paper-pencil instruments and which have been administered in the course of DESI-Study (German-English-Proficiency-Study-International). High inference ratings on general and intercultural instructional quality have been administered and intercultural competence tests for students have been constructed and used as goal variable. Results of multilevel analysis show that general instructional quality as classroom management and positive error correction are important quality indicators for intercultural instruction. Furthermore teachers in classes with less intercultural competence focus on general information about intercultural topics as f.e. stereotyping and prejudices. In contrast in classes with higher intercultural competence, teachers realize discoursive instructional strategies. Qualitative video analysis underlines the importance of the discussion of students’ experiences and cultural meanings to foster the intercultural competence of the whole class. Thus, it is discussed that experiences of students with immigration trajectory can be seen as a resource for intercultural instruction.

Order in the Classroom: Current Research on Classroom Management

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Classroom management is defined as ‘the actions teachers take to create an environment that supports and facilitates both academic and social-emotional learning’ (Evertson & Weinstein, 2006). This definition highlights the key function of classroom management: to make efficient use of the instructional time and enable meaningful learning as well as students’ social growth. Efficient classroom management can be seen as an important component of responsible teaching and is a robust predictor for students’ learning success in classrooms (e.g., Hattie, 2009). Hence, classroom management has a crucial meaning for both, teachers and students, and the improvement of
teachers’ classroom management knowledge and skills is an unquestioned concern. However, little is known about how teachers develop classroom management skills and classroom management is still the most serious challenge for beginning teachers (e.g., Davies & Ferguson, 1997). Moreover, teachers as well as researchers face the challenge to understand how efficient classroom management can be established in student-centered teaching approaches that aim to support students’ autonomy and active learning (e.g., Brophy, 1999). In our planned symposium we address these issues from different theoretical perspectives and by applying different methodologies. We will examine how beginning teachers gain knowledge about classroom management and how teachers’ motivation contributes to successful classroom management. Furthermore, we will examine the importance of teachers’ nonverbal behavior as well as the quality of student-teacher relationships for successful classroom management.

Development of Teacher Candidates’ Classroom Management Knowledge During a Practical Induction Phase

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This study examines whether teacher candidates’ classroom management knowledge increases during a practical induction phase of German teacher education, and which characteristics of the person and the learning environment contribute to this increase. The results indicated that candidates’ classroom management knowledge significantly increased over one year. We found evidence for a mediation effect: teacher candidates with a supportive mentor reflected more on their practical experiences and, in turn, showed higher learning gains. Furthermore, the increase was higher for teacher candidates who were more enthusiastic about teaching, whereas this effect was not moderated by a better use of the learning environment.

Which Motivational Teacher Characteristics Contribute to Successful Classroom Management?

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This study investigates which motivational characteristics in teachers contribute to successful classroom management, as perceived by students and teachers. We questioned whether self-efficacy, enthusiasm for teaching, and the motives of teachers concerning affiliation and power contribute to classroom management. Ratings of classroom management tapped two aspects, monitoring and occurrence of disruptions, and were based upon responses from 208 German teacher candidates and an average of 22 students for each teacher. Structural equation modeling revealed that enthusiasm predicted both aspects of classroom management as rated by teachers and
students. Self-efficacy did not contribute to classroom management. Concerning the motives, power predicted teacher ratings of both aspects of classroom management, whereas the goal of affiliation predicted student ratings. The results support the importance of the motivational characteristics of teachers for both classroom management and instructional quality.

The Relationship between Teacher Nonverbal Behaviour and the Classroom Social Climate

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Classroom management problems preventing beginning teachers from creating a positive social climate are the most important concerns of beginning teachers. Teaching in a multicultural classroom is an additional challenge because of misunderstandings between students and teachers with different ethnic and cultural backgrounds. One source of misunderstanding might be the interpersonal meaning that is given to teacher nonverbal behaviour. In this study the relationship between teacher nonverbal behaviour and the students’ perceptions of the social climate in the classroom are investigated, as well as the moderation of the cultural composition of the class on this relation. Data were gathered in 62 classrooms in schools for secondary education in the Netherlands. Twenty of these classes were multicultural. Clips selected from video-recordings that were recorded in these classrooms were coded for nonverbal teacher behaviour. Data on the social climate in the classroom were gathered using a student questionnaire. Regression analyses showed a large effect for the relationship between teacher nonverbal behaviour and students’ perceptions of teacher control in the classroom, and a medium to large effect for the relationship between teacher nonverbal behaviour and students’ perceptions of teacher affiliation. This effect was not moderated by the cultural composition of the classroom. This suggests that differences in teacher nonverbal behaviour have a similar impact on perceptions of the social climate in culturally homogenous and multicultural classrooms.

Impact of Teacher Differential Behaviors on Mathematics Motivation and Achievement

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This study emerges from a program of research examining interpersonal approaches to instruction and classroom management (Davis, Summers & Miller, 2012). In the study, we examine the contribution of children’s specific ratings of eight different types of differential behaviors (Brophy, 2004; Badad, 1995) to explaining variance in their math motivation and achievement. Participants in this study included 75 first grade students (6-7yrs old; balanced by gender) and their teachers (n=6). Students were sampled from elementary schools primarily serving lower income, minority populations of students. Our goal will be to integrate research on teacher-child relationship quality with research children’s understandings of classroom equity. Specifically, we aim to document and describe how perceptions of differential behaviors might lead to student disengagement and contribute to ‘relationship gaps’ for low-income, minority children. We will suggest new directions for research in the areas of teacher-child relationships and classroom management.

Using research articles to initiate students into ways of knowing, reasoning and communicating

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Scientists spend a substantial part of their work time on ‘minds on’ activities. They search and skim literature, scrutinize other researchers’ manuscripts and produce a variety of pieces of writing. Most of these activities center on research articles. The primary means of communication among scientists, research articles are epitomes of scientists’ ways of communicating, reasoning and knowing. Research articles could, therefore, initiate students into the ‘minds on’ aspects of authentic scientific practice. Students require instructional support when learning with research articles. First, research articles are low in textual cohesion because they target high-knowledge readers. Being peripheral members of the scientific community, students lack background knowledge they could draw on to establish coherence. Second, scientists use their knowledge of the conventional structure of research articles to guide their search for information. And they evaluate the information presented in research articles against epistemic criteria established in the scientific community. Students lack this kind of rhetorical and pragmatic knowledge, which impedes their strategic processing and higher-level engagement with research articles. Few studies have systematically investigated instructional support for learning with research articles. This symposium aims to bring together researchers who have developed direct (Kershaw & Lippman; Ossevoort & Goedhart) and indirect (Braun & Nuckles; Zer-Kavod & Yarden) strategies for using research articles as teaching devices and tested their effectiveness with regard to a range of learning outcomes,
including rhetorical knowledge (Ossevoort & Goedhart; Zer-Kavod & Yarden), scientific reasoning skills (Kershaw & Lippman), critical thinking skills (Zer-Kavod & Yarden) and epistemological understanding (Braun & Nickles).

**Does teaching undergraduates to understand and critique published research have additional benefits?**

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To increase undergraduate students’ ability to understand and critique published psychological research articles, students in a cognitive psychology course completed a structured reading worksheet (RW) homework assignment for each article used in the course. Instruction included an introductory activity providing guidance on how to read the articles and answer the RW questions, and for all subsequent RWs, an in-class discussion, personalized scoring, and an answer key. In Study 1, experimental classes that completed RWs showed larger accuracy gains than control classes on a pre/post multiple-choice test with questions analogous to those on the RW assignment. Specifically, the experimental group had increased accuracy on questions about the participants and procedure, independent variables, dependent variables, and potential criticisms of the research. In Study 2, we conducted qualitative coding of open-ended responses provided by a different sample of participants than Study 1 to a RW question asking for critiques of the research. Analyses compared the proportion of appropriate critiques generated on the first three RW assignments of the semester to the last three assignments. As expected, fewer critiques at the end of the semester were about external validity and more were about internal validity or were requests for additional information about the study. In Study 3, currently being conducted, students complete the pre/post multiple-choice test and a pre/post scientific reasoning task. We expect to see improvement from pre to post on both the multiple-choice test and the scientific reasoning task. We explore implications of these findings for undergraduate instruction of scientific reasoning skills.

**Improving undergraduate life science students’ ability to read and comprehend research articles**

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The ability to read and understand research articles in an efficient way is essential for scientists. Therefore, science students at research universities should be introduced with research articles as early as possible during their academic training. The aim of this study is to evaluate a new teaching design for first-year undergraduate life science students of a research university in which they practiced reading empirical research articles. Our design, based on the work done in the field of genre analysis and argumentation theory, focused on teaching students to recognize seven rhetorical moves (motive, objective, conclusion, implication, support, counterargument and refutation). The teaching design was implemented using tutor-group meetings in a compulsory course in the second semester of the life science bachelor program. To test the effectiveness of our design, we made use
of a pre-test and post-test in which we determined students’ ability to identify these seven rhetorical moves. Furthermore, we determined via questionnaires if students thought that their reading behavior changed during the module and how they assessed their own improvement. Our data show that our teaching design is a successful method to improve undergraduate students’ reading abilities. After the course, students were more able to identify the rhetorical moves in a research article and they also needed less time. The self-assessments showed that students thought that they had become better readers and that they adopted more expert-like reading behaviors.

**Facilitating students’ processing of the ‘rhetoric of science’ while reading research articles**

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Stylistic and rhetorical features of scholarly scientific literature reflect epistemological assumptions scientists’ operate on when reasoning about and communicating theories and empirical findings. Previous findings indicate that reading research articles can improve students’ epistemological understanding of science whereas reading popular scientific literature and science textbooks has detrimental effects. However, benefits of reading research articles seem to be constrained by students’ focus on semantic text comprehension. In two separate studies, we investigated the effects of instructional support for processing stylistic and rhetorical features of research articles. The research article used in both studies had been modified to be comprehensible to high school students. In study 1, n=71 high school juniors were prompted to draw rhetorical and pragmatic inferences or prompted to engage with text contents while reading the modified research article. Results showed that prompting affected processing of the modified research article as well as epistemological reading outcomes. Students under the rhetorical and pragmatic prompts condition drew a significantly higher number of text-driven inferences on stylistic and rhetorical features, epistemological assumptions, authorial intentions and scientific text genre. And they improved significantly stronger in their understanding of the discursive nature of science. In study 2, half of the sample (n=33) received a version of the modified research article in which relevant surface features had been highlighted. Students under the highlighting condition improved significantly stronger in their understanding of the discursive nature of science. We conclude that facilitating students’ processing of the ‘rhetoric of science’ can enhance benefits of reading scholarly scientific literature.

**Characterizing biology students’ scientific writing abilities as a basis for an APL modeling device**

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Writing is one of the primary means of communicating in the scientific community, therefore learning how to produce scientific texts is essential to developing an understanding of science. Adapted Primary Literature (APL) is a text genre that retains the authentic characteristics of primary literature and used for science learning in high-school. It was previously suggested that students should be exposed to examples of adequate scientific writing in order to learn how to write. Thus,
the main goal of our research is to examine students’ scientific writing abilities while using APL as a model. Here we present our initial characterization of high-school students’ scientific writing abilities and critical thinking skills, as reflected in reports of their inquiry projects. A qualitative approach was applied, including interviews with teachers and supervisors and two text analysis tools: a scientific writing assessment rubric and a critical thinking coding scheme, used for analysis of 20 written drafts of students inquiry project reports. Our results indicate that students had problems distinguishing between different sections of the report, justifying the inquiry, providing scientific basis for the hypothesis, distinguishing between different controls, presenting data appropriately and criticizing results. Analysis of the critical thinking skills in the discussion section revealed that identifying and planning relevant controls and identifying assumptions appeared to be the weaker skills. These findings served as a basis for an APL-based intervention, designed to address students’ writing difficulties. We plan to examine the outcomes of the intervention on students’ scientific writing abilities and critical thinking.

Human-Centered Approaches to Developing Usable Educational Technologies

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The purpose of educational technologies is to enhance learning within real instructional settings. It is not enough to develop technologies that increase learners’ knowledge. To be effective within real settings, educational technologies need to meet the users’ needs beyond their desire to learn, they need to be intuitive and easy to use, and they need to be engaging and enjoyable. Yet, often these requirement conflict with each other, and need to be traded off against resource limitations. In order to address conflicting user needs within the constraints of education context, the field of human-computer interaction integrates user-based research with empirical evaluations. This symposium brings together researchers who employ user-centered approaches in the service of developing usable educational technologies that have been proven successful in real educational settings. These technologies have not only been demonstrated to enhance learning, but also to address the challenges that result from conflicting stakeholder goals (e.g., between teachers and students), and to lead to an enjoyable learning experience. We will discuss design frameworks that apply across a variety of formal and informal educational settings. Rau et al. describe a principled methodology to resolve conflicts between instructional goals within the context of intelligent tutoring systems. Avramidies and Luckin present a case study on user-centered design of technologies that support learning about energy consumption within informal context. Pinkwart presents an empirical study that evaluates the effectiveness and efficiency of an educational argumentation technology. Easterday et al. describe a case study which applies a learner-centered methodology to curriculum design.

Resolving Design Conflicts between Competing Goals in Interactive Learning Environments
Designing interactive learning environments (ILEs; e.g., intelligent tutoring systems, educational games, etc.) is a challenging interdisciplinary process that needs to satisfy multiple stakeholders (e.g., teachers, students, parents). ILEs need to function in real educational settings (e.g., schools) in which a number of goals interact. For instance, students want learning to easy and enjoyable, while teachers want to enhance learning by providing challenging problems while keeping the classroom under control. In addressing these goals, developers can draw on a number of instructional design recommendations. For instance, one might employ realistic cover stories. Yet, for young students with low reading ability, cover stories may provide a serious obstacle, which may lead to issues in classroom management (e.g., a math teacher might be preoccupied helping students read cover stories, instead of helping students with the math content). When encountering such conflicting recommendations, developers of ILEs have to rely on ad-hoc solutions. We present a principled methodology to resolve such conflicts between competing design recommendations that occur within the context of real classrooms. We build on a well-established design process for creating Cognitive Tutors, a highly effective type of ILE. We extend this process by integrating methods from multiple disciplines to resolve design conflicts. We illustrate our methodology by describing the iterative development of the Fractions Tutor, which has proven to be effective in classroom studies with 3,000 4th-6th graders.

**Usability and educational effectiveness - the case of educational argumentation tools**

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Usability is a central element of Human Computer Interaction. Quite frequently, educational technology research produces research prototypes which are then used to conduct empirical studies of learning. Here, the usability of the prototype, while typically not in the focus of the educational researcher who designs the system, can be a decisive factor that has an impact on the study results. This paper illustrates this with an example from the field of educational argumentation technologies. In an empirical study, students using an argumentation system with an added mini map of an argument diagram were significantly more effective in handling the system as compared to students using the same system without this usability add-on.

**The Ecology of Resources Design Framework: Teenagers co-design a mobile app to learn about energy**
The Ecology of Resources design framework (EoR, Luckin, 2010) is a participatory methodology that considers the important relationship between the learner in their context and the learning that arises out of their interactions with their context. It defines a method for designing learning technology that is learner-centred. The EoR addresses the need to design for both pedagogical goals and a motivating and engaging learning experience. We present a case study in the application of the EoR framework. This case study explores the challenge of designing learning technologies to support teenagers learn about their personal energy consumption. Teenagers are an important category of future energy consumers. Their understanding of energy related problems and their willingness to address them will shape future consumption. There is evidence that teenagers are aware of energy issues at an abstract level, but do not apply this information in the context of their behaviour. We have worked with 97 teenagers from 4 schools to understand and model their personal context in relation to learning about personal energy consumption. We have co-designed, in collaboration with teenagers, a mobile phone application that addresses the need for learning technologies about energy to be both pedagogically grounded and motivating and engaging to use. We discuss the application of the EoR design framework, identify challenges in the design process and explain how we addressed them. This work contributes to our understanding of how to design learning technologies that support learning about complex scientific issues in informal contexts, and are engaging to learners.

Applying Human-Centered Design methods to Learner-Centered Design: A Case Study

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Educational design based research and learner-centered design (LCD) are established approaches to developing educational innovations, but they have not taken full advantage of methodological advances in human-centered design (HCD). We can increase the responsiveness of LCD to learner needs by re-thinking LCD as a process of focusing, empathizing, defining, conceiving, building, and testing to more easily apply HCD methods. Specifically, LCD can use personas, service blueprints and agile testing to keep the learner in mind, plan the educational innovation and more quickly iterate based on feedback. However, HCD methods must often be modified for an educational context for example, personas must take into account both the start and end points of learning (rather than only describing user’s needs). Other aspects of LCD, such as the alignment of goals, assessment and instruction, and design argument are well suited to addressing learning issues and should not be replaced by HCD methods. We illustrate these points with a case study of the
design of Immigrant Voices, a curriculum for teaching civic media documentary design to an immigrant population in an urban public school.

Predictors of early literacy development

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Although there have been tremendous efforts in the last years aimed at promoting students’ literacy skills, achievement studies report that a substantial proportion of students faces deficits in reading and writing (Programme for International Student Assessment, PISA; OECD, 2010). Becoming literate is a cornerstone of academic achievement and learning to read and to write is a key objective in the first grades of school (Wilson & Trainin, 2007). Despite much research interest in early literacy development, there is lack of information about the joint contribution of different individual (such as verbal and nonverbal skills) as well as different environmental factors (such as classroom and community level characteristics) to children’s acquisition of literacy. Furthermore, only few longitudinal studies on reading difficulties have extended beyond the first few years of reading instruction and investigated developmental trajectories of children with and without reading disabilities. The aim of the symposium is to shed light on these remaining questions and to add important information on the identification of risk and supportive factors in children’s early literacy development, thus informing policy and practice in order to effectively reduce literacy achievement gaps.

A longitudinal investigation of the link between rapid automatized naming performance and reading

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In recent years, performance on rapid automatized naming (RAN) tasks, which assess the speed of naming sets of familiar stimuli, has emerged as one of the most robust predictors of children’s
progress learning to read. However, key questions remain regarding whether RAN’s link to reading is causal, and whether it is independent of other known correlates of reading, such as phonological awareness, executive functions, and speed of processing. To resolve these issues, we carried out a three-year longitudinal project involving 98 children, recruited to the study as three-year old non-readers attending nursery. Their emerging reading abilities were then tracked through their first two years of formal schooling. At baseline, we carried out detailed assessments of non-alphanumeric RAN and other key linguistic and cognitive factors. We then investigated which factors account for unique variance in RAN in young, non-readers and the extent to which RAN, independent of the other factors assessed, predicts unique variance in aspects of the children’s emerging literacy. Results suggested that pre-literate RAN is related to diverse cognitive factors, including visual and phonological processes and working memory. However, RAN emerged as a unique predictor of later reading abilities, particularly those tasks requiring lexical knowledge, suggesting causal antecedence. Implications of findings for both theory and practice are discussed.

The effect of verbal and nonverbal skills on the acquisition of reading: Evidence from Iceland

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Despite much research interest in the development of literacy across languages, there is shortage of comprehensive studies exploring the role of both verbal and nonverbal skills in learning to read shallow orthographies. This longitudinal study examined how the acquisition of reading in a transparent orthography is connected to phonological and oral language skills and the ability to regulate attention, cognition and behaviour, which has repeatedly been found to be related to various aspects of academic ability. Participants were 111 4-year-old Icelandic-speaking children who were assessed on letter-knowledge, verbal abilities and two measures of self-regulatory skills, and their performance related to their literacy skills two years later. Letter knowledge and phonological awareness explained significant variance in all the outcome measures, while vocabulary, listening comprehension and self-regulation were only connected to reading comprehension and vocabulary knowledge. Consistent with studies of English-speaking children, these results indicate that letter-knowledge and phonological awareness are the most consistent predictors of children’s early reading achievement in transparent orthographies. In contrast, oral language skills seem more strongly connected to comprehension skills. The results further suggest that other developmental factors, such as self-regulation, play an important role in literacy acquisition, particularly in those aspects that require a relatively high degree of metacognitive control, such as reading comprehension and the ability to define spoken words.

Linking Individual, Classroom, and Community Characteristics to Literacy Skills

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The present study examined the extent to which individual, classroom, and community characteristics account for differences in literacy skills. At the beginning of the school year, a large sample of German third-grade students (N = 789) was administered standardized reading and writing achievement tests. Additionally, students’ general abilities, domain-specific self-control, and reading motivation were assessed. Students’ general abilities made the largest contribution to the prediction of concurrent reading and writing skills, both on the individual and classroom level. On the individual level, motivation and schoolwork-related self-control added to the explanation of individual differences in literacy whereas interpersonal self-control did not. The findings imply that a domain-specific perspective on self-control may contribute to an advanced understanding of academic performance disparities. In addition, neighborhood context related to students’ writing skills. Students from higher SES communities demonstrated higher writing skills compared to students from lower SES communities. The present research suggests that policy and intervention need to recognize the ecological nature of development and functioning, and target more than one context in order to effectively reduce literacy achievement gaps in elementary school students.

Late-Emerging and Resolving Dyslexia: A Follow-Up Study from Kindergarten to Grade 8

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This study presents a longitudinal examination of the stability of reading difficulties (RD) in Grades 2 and 8 in a Finnish sample drawn from the Jyvaskyla Longitudinal Study of Dyslexia. Children were followed from Kindergarten to Grade 8 and children with RD were identified in Grades 2 and 8. Four groups of children are identified: 1) Persistent RD (n=30): RD in grades 2 and 8, 2) Late-emerging RD (n=19): no RD in Grade 2 but RD in Grade 8, 3) Resolving RD (n=12): RD in Grade 2 but no RD in Grade 8, and 4) Typical readers (n=121): no RD either in Grade 2 or in Grade 8. For the purposes of early identification and examination of risk and supportive factors we report group comparisons of familial risk for dyslexia, gender, various cognitive and language skills, attention, and print exposure from Kindergarten (5-6.5 years) to Grade 8 (14 years). The analyses
revealed significant differences between the groups in all the domains of interest. The findings offer support for the notion of developmental heterogeneity in RD, and adds to the current knowledge of the risk and supportive factors for the different developmental RD paths.

**Language use and language acquisition in learning mathematics and science at school**

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According to Tomasello (1999) there are three dimensions of language influencing cognitive development and learning: (1) Linguistic communication ‘transmits’ knowledge through instructions and explanations; (2) language functions as means of representing information; (3) linguistic interaction induces children to take different conceptual perspectives. Coordinating different views contributes to the development of argumentation and self-reflective thinking. All three dimensions of language are highly relevant for teaching and learning at school. In fact, language proficiency is one of the most important predictors of school achievement. This is particular true for students with multilingual background since they face the challenge to acquire conceptual understanding while refining their language competencies in a second language. In this symposium, we consider the dimensions of language influence with respect to monolingual and multilingual students’ conceptual learning and problem-solving in mathematics and science as they reveal an intricate relationship between the processes of cognitive modeling, language representation, and language use. The papers explore the relationship between language and thought on the level of the individual, classroom practices, and learning environment. Two papers examine the importance of teacher-student discourse and specific language-based scaffolds for the development of subject-specific language skills and conceptual understanding in a preschool science context. A third paper asks how teachers can learn to scaffold primary students’ subject-specific language in mathematics. Finally, the fourth paper explores to what extent secondary and university students represent mathematics content in the instructional language and its relation to the first language and what cognitive costs are associated with this.

**Promoting academic language use in early science interactions: an intervention study**

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This study focuses on the linguistic content of science lessons to 5-year-olds. We examine how teachers can promote 5-year-olds’ developing abilities to verbalize the intuitive understanding they possess of physics phenomena. Even though children possess such intuitions, based in sensorimotor representations of previous experiences, sharing insights in an efficient and meaningful way with peers and teachers can be challenging. We propose that an early command of ‘academic language’ (AL) skills enables children to do precisely this. Moreover, we propose that teachers’ guidance is invaluable for children’s developing AL skills. In this study, we present the results of a teacher-directed intervention study. In a randomized design, 59 teachers and 230 children were observed twice (winter and late spring) during science lessons about light reflection and air pressure respectively. Thirty teachers attended a training session after initial observation, in which they learned about AL, and the affordances of early science lessons to promote AL in 5-year-olds. Results show that, the Academic Language Training increased lexical richness of the conversations, the rate of domain-specific words, such as air pressure, mirroring, reflection, the rate of general academic words, and the use of complex grammar. In addition, trained teachers engaged more in scientific reasoning than the controls did. The effects were, however, task specific. Finally, the conversations led by trained teachers contained more episodes in which the children displayed content knowledge.

**Scaffolding children’s acquisition of science concepts by means of language support**

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In a number of studies in education and cognitive psychology the impact of language use on content learning has been targeted. According to assumptions of contextual learning theories, language is considered a mental tool for the construction and negotiation of (conceptual) meaning. Specifically, language may be employed in order to highlight structural similarities underlying phenomena and categories of the physical world which otherwise are perceived less easily by learners. This linguistic support in terms of modeling and focusing, or scaffolding (e.g., Pea, 2004), may be especially helpful for learners with low language proficiencies. In the two presented studies, we investigate the role of linguistic support on students’ conceptual understanding in two different settings, shedding light on basic assumptions concerning the impact of language as a mental tool in science activities. In study 1, language- prompted comparisons were associated with an increased accuracy of preschoolers in predicting an object’s floating or sinking in an experimental context. Preliminary findings of study 2 revealed that contexts of early science learning provide ample opportunities for second language learners’ construction of word meaning.

**Learning to scaffold language in a multilingual mathematics classroom**

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In this paper we present a study on scaffolding students’ language required for mathematical learning in multilingual classrooms. The research question we address is how a teacher participating in dual design research can learn to scaffold students’ language required for mathematical learning in multilingual classrooms. We assumed dual design research was a fruitful way to foster and trace the development of a mathematics teacher’s expertise as it aims to study the learning of students’ and their teacher within the same study. Lesson series about line graphs were co-designed by the researchers and the teacher, and empirical data were collected from two teaching experiments (each eight lessons, 21 and 22 students aged 10-12). The teacher’s learning process was promoted (e.g., by conducting stimulated recall interviews and providing feedback) and traced (e.g., by carrying out pre- and post-interviews). We used an analytic framework for teachers’ reported and derived learning outcomes to analyse pre- and post-interviews. The result showed the teacher’s learning process in terms of changes in knowledge and beliefs, changes in practice and intentions for practice. Further analysis revealed that this learning process can be attributed to the characteristics of dual design research, for instance its cyclic and interventionist character, the continuous process of prediction and reflection that lies at its heart, and the process of co-designing complemented with stimulated recall interviews.

Language-switching costs in bilingual mathematics learning

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Bilingual education programs implicitly assume that acquired knowledge is represented in language-independent way. This assumption, however, stands in strong contrast to research findings showing that information may be represented in a way closely tied to the specific language of instruction and learning. In this contribution, two studies are presented which aim at providing further insights into the cognitive processes of bilingual mathematics education. In study 1, we examined whether and to which extent language-switching costs occur when secondary school students of bilingual programs need to switch languages across instruction and retrieval in the domain of arithmetic. Thirty-nine German-French bilingual students underwent a four-day training on multiplication and subtraction problems in one language (German or French), followed by a test session in which they had to solve trained as well as untrained problems in both languages. We found that cognitive costs related to language switching appeared for both arithmetic operations. In study 2, we built upon these findings and investigated cognitive sources of language-switching costs using neuroimaging. A similar procedure as in study 1 was applied on 29 Italian-German bilingual students. Here, however, fMRI was applied during the test session. We found that language-switching costs were accompanied by increased activation in areas associated with magnitude processing, visuo-spatial, numerical stimulus recognition, and executive functions. Implications of our findings are discussed with respect to bilingual education, to the cognitive mechanisms underlying bilingual learning, as well as to designing interventions to reduce cognitive costs in order to fully exploit the potential of bilingual education.

The integrated world of excellence.

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This symposium on integrated excellence focuses on talented students from pre-university to professional excellence in an international context. Five universities from four different countries are involved. We wish to discuss empirical research findings on high ability and excellence at pre-university and university level as well as the professional field. Presentation 1. In the whole of Europe the promotion of young talent in the field of natural sciences is in the focus of interest. This study aims at the evaluation of a special pre-university programme regarding its processes and effect upon students, teachers and university lectures. Presentation 2. Ethical sensitivity of high ability students may be supportive in their contribution to worldwide problems we face today, like climate change and poverty. This cross cultural study looks into ethical sensitivity as a possible characteristic of high ability university students. Presentation 3. Honours students are both able and willing to do more than regular curriculum offers. The focus of this longitudinal cross institutional comparison on honours versus non-honours students is whether they look for different qualities in teachers and courses. Presentation 4. A clear understanding on professional excellence is important for students, teachers as well as professionals. Based on a focus group design a conceptual profile of what can be expected from high ability aspirant, novice professionals when they leave university will be discussed.

Promoting talented students at the interface between upper secondary level and university

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In the whole of Europe the promotion of young talent in the field of natural sciences is in the focus of interest. Since 2009 the Technical University of Munich (TUM) has been running a pilot project on special programme for students interested in and talented for STEM (science, technology, engineering, mathematics). In a distinct upper secondary level track at the Otto-von-Taube-Gymnasium (ordinary state grammar school) 30 selected students both male and female are involved in a demanding advancement program based on the principles of acceleration and enrichment. The program itself differs from others in that it enhances the interconnection between school an university by taking into account whatever the institutions may require in terms of organisation, personelle and contents. The study aims at the evaluation of the special programme regarding its processes and effects upon students, teachers and university lectures. The evaluation concept is based on the CIPP model as developed by Stufflebeam with its focus on context, input, process, and product. The study-design is that of an explorative study collecting process data, thus using qualitative methods. At the same time and despite small samples only, quantitative methods are
applied and set against data derive from large scale studies such as PISA. The findings show that the TUMKolleg students are capable of handling scientific methods and that neither their performance motivation nor their extra-curricular activities are affected by the heavy workload they are facing. Teachers and university lectures profit from this interexchange.

**Ethical sensitivity of high ability students- international comparison of Finnish and Dutch students**

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The study examines the ethical sensitivity of Finnish and Dutch students (N=937) using a 28-item Ethical Sensitivity Scale Questionnaire (ESSQ) (Tirri & Nokelainen, 2011). The ESSQ is based on Darcia Narvaez’s (2001) operationalization of ethical sensitivity to include seven sets of skills that operate on a more general level: (1) Reading and expressing emotions, (2) Taking the perspectives of others, (3) Caring by connecting to others, (4) Working with interpersonal and group differences, (5) Preventing social bias, (6) Generating interpretations and options, and (7) Identifying the consequences of actions and options. The results showed that there were the differences in self-reported ethical sensitivity between high and low ability students and between Finnish and Dutch students. High ability students’ ethical sensitivity was higher than low ability students’. This difference was evident also when the nationality was taken into account. Over all, Dutch students rated their skills lower than their Finnish peers. The study discusses the differences between nationalities and how education could endorse the ethical sensitivity of high ability and other students.

**Further explorations into qualities honours students look for**

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Wolfensberger (2004) concluded that ‘there are differences between honours and non-honours students in the value they place on specific qualities of teachers, fellow-students, and courses. Wolfensberger and Offringa (in press) validate the outcomes of the 2004 article by answering the questions: do honours (versus non-honours) students look for different qualities in teachers and courses? Are differences constant over time and across universities? Results show honours students find it more important than non-honours students that teachers have high expectations of them. Furthermore, honours students want to be challenged and inspired more than non-honours students. Also, honours students find it much less important than non-honours students that courses are useful for their profession or career. Instead, they put more emphasis on courses raising new questions than non-honours students. All these differences are visible throughout the years and in
different educational contexts. The present paper seeks to expand the outcomes by collecting additional, new data, answering the latter question in more detail, looking for trends throughout the years, and relating differences found to background characteristics of students. The existing data were gathered cross-institutional in The Netherlands between 2003 and 2011. Subjects were 491 honours (bachelor) students and 908 non-honours students.

Characteristics of excellent professionals: a mixed method design in four professions

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Talented students have the potential to develop into the excellent professional of the future. This notion forms the basis of honours programs that were introduced in Higher Education in the Netherlands, in the last few years. This principle requires a focus on the interpretation of the concept ‘professional excellence’. But, what professional characteristics are typical for an ‘excellent professional’? What performance results in labelling this person as ‘excellent’ by his professional environment, and distinguishes him from a regular or good professional? This study aims to explore professionals’ perspectives of what are characteristics of an excellent professional, resulting in conceptual profiles for four different professional fields, being the field of Allied Health Care, International Business, Information and Communication Technology and Sports. An inter professional focus group design in four professions in the Netherlands was used. Three consecutive focus group discussions per field resulted in conceptual profiles, (n= 12 focusgroeps), one conceptual profile for each profession. The content validity of these profiles was tested by using Delphi panels in 15-29 experts for each of the four professional fields. General characteristics: referring to all four of the professions, like communicating on different professional levels, adapted to different complex contexts. Showing self awareness and being critical towards the own professional performance, and being innovative and inspiring to others. More profession-bound markers were found, like being result driven (International Business), underpinning professional performances with evidence (Allied Health Care), being socially involved (sport professionals) and taking initiative in specific client related tasks (ICT).

The dynamics of task behaviour: Motivation, emotion and performance

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The theme of the conference has expressed a challenge for today’s educational researchers to identify and encourage the development of ‘learning processes, which are meaningful and useful, aware and reflective, focused on higher order skills and deep understanding’. The research presented
in this symposium has taken a step in this direction with its focus on accessing the psychological processes that characterize the ways different students engage with tasks in learning and performance situations. Four papers examine in detail how students approach and experience different types of tasks and how those perceptions and experiences influence their self-regulation, task behaviour and performance. Together, the findings demonstrate the importance of acknowledging the interplay between individual differences in children motivational tendencies, task-specific experiences and characteristics of the task. In terms of practical implications, the findings of all papers highlight the importance of gaining a better understanding of both students' characteristics and situational dynamics of task engagement, as well as how such understanding helps us provide better support for students with varying needs.

**Interest and task processing: Identifying profiles of motivation, emotion and strategic processing**

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Reactions of 5th and 6th grade students to an on-line open-ended problem task were monitored to identify changes in and contingencies between task interest, affect, resource information use, and quality of arguments students’ presented to support their answers to the problem. Three interest trajectories were identified and significant differences were found in on-task processes and quality of argument in students’ answers. Time trails of resources used across the task will be presented to illustrate strategic decisions. Knowledge of these patterns of decisions, thoughts and feelings while engaged in problem solving will assist in supporting students to develop effective thinking skills.

**Temperament as a predictor of children’s emotions during a problem-solving task**

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Although academic and achievement-related emotions have received increasingly attention in recent research on learning and motivation, the situational dynamics of task-specific emotions and individual differences contributing to the emergence and fluctuations of those emotions are still less studied. Drawing on a neurobiological approach to motivation, affect and temperament, this study examined the extent to which certain aspects of children’s (270 fifth- and sixth-graders) temperament (i.e., BIS sensitivity, BAS reward responsiveness and BAS reward seeking) predicted the onset and change trajectories of their on-task emotions (i.e., happiness, anxiety and hopelessness) during a problem-solving task. Based on a series of latent growth curve models we found systematic individual differences and overall changes in students’ emotions and their mutual relations across the task. Each aspect of temperament contributed individually to the level of specific emotions in the beginning of the task and to the changes in them while the task unfolded. The results points out to the significance of the interplay between task parameters, students’ interpretations of those parameters, and how they are linked to individual differences in students’ motivational tendencies.
Are reappraisal effects on self-control and cognitive performance a function of reappraisal goals?

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Considering negative emotions’ detrimental effects regarding overall academic achievement, adaptive emotion regulation is presumed to be relevant for academic success. Ego depletion research suggests a competitive relation between emotion regulation (ER) and other self-regulatory acts. Yet positive emotions can counteract depletion effects. The objective of the present study was to compare the effects of two variations of reappraisal which either involve the elicitation of positive emotions or not on affect, self-control, and working memory within an experiment (N=94; Mage=26.2; SD=7.5; 80% students). A negative emotion was induced by false negative feedback on a cognitive ability test (η=.15). We contrasted two experimental groups (2 different regulatory goals: increase positive, decrease negative) that were instructed how to regulate their emotions prior to emotion induction with two control groups (no emotion regulation, no emotion). Treatment and time interacted with respect to affect (η=.14): Increase positive reappraisers’ affect not only recovered from emotion induction but exceeded the prior level, whereas decrease negative reappraisers’ and non-regulators’ impaired affect remained constant after emotion induction, and controls even felt worse. Positive affect predicted self-control capacity at all measurement points (b=.40/.41). As for working memory performance only performance on the distractor task (η=.12) was affected by reappraisal, which was higher for increase positive reappraisers compared to decrease negative reappraisers. Results indicate that reappraisal focusing on increasing positive affect is related to favorable outcomes regarding affect, self-control, and cognitive performance, making it preferable to reappraisal focusing on decrease of negative affect.

Associations between emotional states and persistence during challenge in math and reading

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During their school career, students are facing academic challenge across different domains. The experience of challenge is accompanied by a host of different motivational and emotional experiences. However, only a few studies thus far have integrated on-task measures of these processes during mathematical or reading activities (e.g., Ainley, Corrigan, & Richardson, 2005; Tulis & Ainley, 2011). In particular, there is a paucity of research on differential effects of activating and deactivating emotions (Pekrun, 2006) on students’ persistence during challenging tasks. The current studies address this deficiency by measuring 6th and 7th grade students’ task-related emotions (enjoyment, anger, anxiety, boredom) at three time points during a challenging math task (Study 1) and reading task (Study 2), respectively. The results of both studies emphasize effects of (both positive and negative) activating emotions conducive to students’ persistent engagement through challenge, whereas boredom (a negative-deactivating emotion) has been found to be detrimental for persistence.
Changing experiences in the home learning environment: Conditions and effects

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Over the last decades numerous studies cumulated empirical evidence that the home learning environment (HLE) is an important source of influence on children’s cognitive and social development. Most of the studies treated the HLE as a static construct, mostly measured at one time point. Only a few studies examined the dynamics of the HLE indicating both stability and changes in the HLE (e.g. Son & Morrison, 2010). The present symposium therefore aims at widening our understanding of the home learning environment as a dynamic system and presents four longitudinal studies on the stability and changes of the HLE conducted in Portugal, England, and Germany. Toth and colleagues investigate the association between different dimensions of the HLE across the ages from 3 to age 14 and how family characteristics contribute to those different HLE measures across time in England. Pinto and colleagues present results on the stability of the HLE concerning an age period from childcare to primary school in Portugal and investigate the impact of the HLE on later literacy skills. Lehrl and Rossbach focus on the stability and changes of different dimensions of the HLE during preschool up to primary school in Germany and investigate which parents change their practices. Evangelou and Lake present findings from an evaluation study in England and investigate the effects of the HLE on literacy and language outcomes. Implications for conceptualizing and measuring the HLE across time will be discussed.

Family characteristics and home learning environment across time

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The child’s home learning environment (HLE) in the early years has been found to have positive effects on later academic attainment and social-behaviour (Melhuish et al., 2008; Sammons et al., 2004; 2007a; 2007b; 2008a; 2008b) up to end of primary school, and remains a significant predictor of educational outcomes up to Year 9 (Sammons et al., 2011a; 2011b). As HLE significantly predicts the way children attain and progress in their academic career, it is important to establish what family characteristics predict HLE and how the child’s HLE experience also changes over time. Multilevel models investigate the relationships between various family characteristics and measures of the child’s HLE at four different time points using data from the longitudinal educational effectiveness study (EPPSE) conducted in England. The way different measures of HLE are associated across time is also investigated. The same set of family characteristics show different effects in predicting HLE depending on the time point and HLE dimensions used as outcomes. For example, girls experienced higher levels of early years HLE as reported by parents and generally have higher scores for several HLE measures in primary school, but have lower scores for HLE computer usage at age 11. Ethnicity, salary, family SES, parental occupation, neighbourhood disadvantage and early years HLE significantly predicted different dimensions of HLE from various time points (3, 7, 11) up to age 14.

The quality of the home environment in early childhood: stability and its effects over time

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A great deal of evidence suggests the relevant role of the quality of the home setting for children’s adjustment (NICHD, 1998), cognitive performance (Bradley, 1993; Molfese, DiLalla, & Bunce, 1997), intellectual and social development (Sylva, Melhuish, Sammons, Siraj-Blatchford, & Taggart, 2008). However, few studies examined the home environment longitudinally, particularly in south European countries. This study examined the stability of the home environment and its effects on literacy skills. Participants were 95 children and their families. The quality of the home environment was assessed with the HOME (Caldwell & Bradley, 1978) in three moments: childcare (1/2 years-old), preschool (3/4 years-old) and upper elementary school (8/9 years-old). In preschool, children’s vocabulary was assessed. In 4th grade, children’s vocabulary and text comprehension were assessed. Results show that the home environment quality was quite stable over time. In addition, path analyses revealed that the quality of home environment in preschool was a positive contributor both for preschool vocabulary and for 4th grade literacy skills, even after controlling for concurrent home environment and other relevant covariates, such as children’s prior achievement and maternal education. This pattern of results confirms previous findings about the relevance of the home quality for childrens outcomes and extends these findings through 8/9 years of age. Results suggest that the HOME scores were a stable predictor of early vocabulary skills and that the preschool period is of particular importance in setting the stage for the development of academic skills that are crucial to school success.

Continuity and changes of the home learning environment from pre- to primary school in Germany

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Although numerous studies report on the significance of the early home learning environment (HLE) for children's competence development, only few studies investigated the HLE itself in its structure, stability and changes over time. The paper therefore examines stability and changes in different facets of the early home learning environment (HLE) as children approach school entry and whether these changes predict later HLE in primary school. Data were drawn from the German longitudinal study BiKS-3-10, which follows about 500 children from preschool age till the end of primary school. Different dimensions of the home learning environment were identified, covering formal experiences, i.e. teaching literacy at home and informal experiences, i.e. language stimulation while book-sharing. The HLE dimensions were measured by questionnaires and quality ratings of an observed shared-book-interaction at three time points during preschool age (3 to 6 years) and at primary school through quality ratings of an observed problem-solving task. The findings reveal moderate stability of the different HLE dimensions over the preschool period. Changes were also observed: almost 60% of the parents increased (i.e., changes greater than 1 SD) the frequency of teaching literacy but only 10% of the parents increased their quality of language stimulation. Quality changes while book-sharing were more likely to be observed from mothers with more education while changes in teaching were independent of family characteristics. More important, the degree of change in quality of language stimulation uniquely contributed to the HLE at primary school age.

The Home Learning Environment as a predictor of Language and Literacy Development at ages 4 and 5

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Parenting practices, such as reading to children are associated with better emergent literacy outcomes, specifically; vocabulary size, phonemic awareness, print concept knowledge and responsiveness to reading (Bradley 2002; Dickinson & Tabors 2001; Raikes et al. 2006; Carlson et al. 2012; Haak et al. 2012). Other home learning experiences which might influence literacy attainment in young children are; reciting nursery rhymes, alphabet games and participating in outings to the library (Rodriguez & Tamis-LeMonda 2011). These early literacy activities greatly influence the life-chances of children in all communities (Lindsay & Dockrell 2008; Allen 2011; Sammons et al. 2011). However, disadvantaged families’ resources are being stretched which can influence the quality of the interactions in the HLE (Evangelou et al. 2009; Justice et al. 2010; Siraj-Blatchford 2010; Field 2010; Hartas 2011). Therefore, it is important to examine further what is the nature of the impact of the HLE on the language and literacy outcomes of children from lower socio-economic backgrounds, and in turn, how this might influence their development in the formative early years before school. This paper investigates the above over two time-points. Secondary data analysis was carried out on data from The Birth to School Study (Evangelou et al. 2007) to measure the degree of the impact of three-year-olds’ HLE on their literacy and language outcomes at four and five years old.

Continuity and change in the growth of children’s mathematical understanding
When assuming a constructivist perspective on the study of learning and development the tension between continuity and change looms large. On the one hand, learners’ knowledge and skills are transformed over time, sometimes in ways that seem to be quite radical. On the other hand, constructivism leads us to assume that new knowledge and skills must be constructed and shaped out of what already exists. This tension between continuity and change appears in contemporary attempts to understand the growth of children’s mathematical understanding, as it does in other areas. The invited symposium of SIG 3 ‘Conceptual Change’ will use the example of children’s mathematical learning to discuss the roles of continuity and change from different theoretical and empirical perspectives. The four contributions all investigate continuity and change in some aspect of mathematical understanding but highlight different aspects of the theoretical challenge: the tension between individual cognition and changes in collective (cultural) representations (Saxe); what changes and what stays the same across different contexts of application of a concept (Nunes); the similarities and differences between early student conceptions and those that are the target of instruction later on (van Dooren & Verschaffel); and the appropriateness of the assumed gradualness of change in the case of perceptual learning and the abruptness of analogical learning (Alibali & Sidney). While the symposium brings together research on mathematics learning, the theoretical issues addressed are relevant to the challenge of understanding continuity and change in other domains as well.

Cultural development of mathematical ideas: Studies through time in Papua New Guinea

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Psychological studies of numerical cognition are often conducted without regard for the interplay between the cognitive activities of individuals and the cultural histories of collective representations and ideas in communities. A difficulty with this psychological approach is that studies provide a limited view of the dynamics of culture-cognition relations, arguably at the heart of understanding both cognitive and cultural processes. Drawing on my recent book, Cultural Development of Mathematical Ideas (Cambridge Univ. Press, 2012), I offer a heuristic framework for examining emergent processes whereby (a) local actions of individuals lead to the alteration of historical developments of collective representations and ideas in communities as well as (b) how historical developments in the collective representations used in community life have reciprocal implications for the cognitive developments of individuals. Drawing on a study from the book, I illustrate the framework by sketching a multimethod study conducted in 1978, 1980, and 2001 with a remote highland Papua New Guinea community, the Oksapmin. I provide evidence that suggests that forms of collective representations for currency units are unwittingly reproduced and altered by individuals as they engage in communications that emerge in collective practices of daily life, like economic exchanges in Oksapmin trade stores. In turn, in the process, these exchanges seed new developments in cognitive developmental processes. I argue that the methodology, though
developed with a remote group, can be useful for the study of for knowledge domains other than number and communities other than the Oksapmin.

The inverse relation between addition and subtraction: Continuities and discontinuities

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Although the inverse relation between addition and subtraction may seem a unitary concept, this presentation reviews research that suggests that it must be constructed and reconstructed over time in different contexts before children can use it in a variety of mathematical tasks. At first, this idea is understood is in the context of attributing a number to a quantity: from about age 5, children are able to realize that if you add n and subtract n to a set, the number in the set does not change. However, they do not seem to be able at this time to use the inverse relation between addition and subtraction to solve word problems, and many do not realize that a missing addend problem is most easily solved by a subtraction, particularly if the numbers are large and they can use a calculator. Students respond well to instruction about the inverse relation in the context of problem solving in primary school but this is far from the last step they need to take in order to understand the inverse relation. In a recent study we found that, after instruction about the use of the inverse relation in the context of natural numbers, many students found it difficult to use the same reasoning when whole numbers were introduced. They realized that they needed to use a subtraction to invert a transformation but were not certain about ‘what it meant to minus a minus number’. I suggest a framework for the interpretation of these results.

The development of the rational number concept from a conceptual change perspective

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This paper starts from the basic assumption that learning rational numbers requires a ‘conceptual change’, given that there is a conflict between students’ deeply rooted prior knowledge about natural numbers and the newly taught conceptualization about rational numbers. Three sets or research findings are discussed in support of this assumption. First, we discuss findings from a wide range of studies, showing how students’ errors on a variety of rational number tasks can be explained and predicted by the discrepancy between features of rational numbers and students’ prior knowledge about natural numbers. Second, we show, by means of comparative studies, that regardless of curricular differences very similar difficulties and misconceptions can be observed in the development of rational number concepts in different countries, indicating that natural number prior knowledge plays the same role regardless of the curriculum. Third, we explain how even in students and experts who no longer commit errors to rational number tasks, indications of natural number interference can still be found in terms of reaction times. We conclude that one can speak of a gap in the development of the number concept as soon as rational numbers are involved, and natural number knowledge remains interfering. Research on the treatment of the transition from natural to rational numbers is treated in textbooks, however, indicates that differences between the rational and natural number system are rarely made explicit, while similarities are exploited. This may contribute to the difficulties that students experience in acquiring rational number understanding.
Paths of continuity and change: Evidence from perceptual and analogical learning

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??
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Paths of continuity and change in mathematics learning may depend on the mechanisms that give rise to that learning, and on the level of analysis at which change is considered. This talk addresses two learning mechanisms—perceptual learning and analogical learning and their implications for continuity and change. Perceptual learning occurs when learners are repeatedly exposed to exemplars of a given class. It typically involves gradual, incremental improvements in performance. I present a microgenetic study documenting perceptual learning in children learning about equations. Children displayed gradual improvements in their perceptual encoding, and some children also shifted abruptly to using new, correct strategies for equation solving. Gradual improvements at one level of analysis (encoding) sometimes potentiated abrupt change at another level (strategies). Analogical learning is often thought to involve ‘insight’, or sudden change. I present a study of analogical learning about fraction division. Prior to a lesson, children practiced with one of two analogical domains: whole number division or other fraction operations. Conceptual knowledge gains were greater in the whole-number division group; however, overall gains were small and variable. The analogical lesson introduced relevant division concepts into children’s thinking, leading to piecemeal, gradual changes in conceptual knowledge. Different learning mechanisms may lead to different paths of change, though sometimes in unexpected ways. Change due to analogical learning is not always abrupt, and change due to perceptual learning is not always incremental. Conclusions about continuity and change depend critically on the level of analysis at which knowledge structures are described.

Early retention in kindergarden: risk factors and pathways in primary education

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In French-speaking Belgium, about 4% of the children are retained in kindergarten. What are the pupils’ characteristics and the school context variables predictive of the retention in kindergarten? What are the pathways in primary education of ‘retained’ pupils compared to their peers who started 1st grade ‘on time’? How can this early retention be explained? A broad database with entire cohorts has been used for studying the risk factors and the pupils’ school careers in primary education. Moreover, teachers’ beliefs about retention, learning and teaching have been investigated through a questionnaire administered to a representative sample of preschool and 1st grade teachers. The multilevel regression analyses show that the following variables are significantly
predictive of retention in kindergarten: month of birth, gender, socioeconomic status, country of
birth and at the school level, mean school social intake. Investigation about teachers’ belief shows
that the vast majority of teachers are convinced that retention in kindergarten is beneficial for later
achievement and not detrimental at a psychological level. Preschool and 1st grade teachers share
some mutual expectations about the level of prerequisites for entering 1st grade. Even if they are no
formal instructions or benchmarks, kids who are not ‘ready’ should not enter 1st grade, but rather
stay one more year in kindergarten. Those results can be related to the ‘culture’ of the education
system in Belgium, a non-comprehensive one: pupils with learning difficulties are kept apart from
their age group or peers through grade retention, early tracking and special education.

‘Sink or swim”: buoyancy and coping in the test anxiety and academic performance relationship

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In this study we examined the moderating role of academic buoyancy and the mediating role of pre-
exam coping in the test anxiety and performance relationship. Self-report data were collected from
325 secondary school students following a programme of study leading to the school leaving
qualification, referred to as the General Certificate of Secondary Education (GCSE). We collected
grade outcomes in English, maths and science and prior attainment in the same subjects. Worry
predicted a lower GCSE grade, which was partly attributable to students using less task-focused
coping. Tension predicted a higher GCSE grade through a greater use of task-focused coping.
Academic buoyancy moderated the relationship between worry and GCSE grade by reducing the
strength of the inverse relation in highly buoyant students. These findings highlight the potentially
protective and buffering roles of academic buoyancy and task-focused coping.

Does student motivation really decline? Re-examining motivational change in the Chinese context

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Considerable research has shown that school motivation decreases over time. However, most of these studies have been conducted in Western societies. The aim of this study was to examine motivational change in the Chinese cultural context. Hong Kong secondary students (N = 6,111) participated in the study. Four types of goals—mastery, performance, social, and extrinsic—derived from Personal Investment Theory were measured across three time points. Latent growth modeling (LGM) was used. Results showed that mastery, performance, and extrinsic goals were stable across time. However, social goals exhibited a significant decline. These findings contradict previous Western research which has claimed that motivational decline is inevitable. Findings are discussed in relation to the Chinese cultural context.

Ethnic disparities in educational success in Germany: Is there evidence of segmented assimilation?

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Using the extended national data set of PISA 2003 (N = 44,473) the educational success of students of the five largest immigrant groups in Germany (from the former Soviet Union, Turkey, Poland, former Yugoslavia and Italy) as well as the economic and cultural capital of their families are studied. It is asked if the five largest immigrant groups show different patterns of disparities indicating different kinds of assimilation processes, especially downward assimilation of students from former labour migrant countries. Additionally, it is examined how important economic and cultural capital are for explaining disparities in educational success. The results confirm former research findings showing that young Turks, Yugoslavs and Italians are more disadvantaged than other immigrant students in Germany. But no sound evidence is found for downward assimilation of these groups. On the contrary, reading competency as well as economic and cultural capital in the families seem to improve from first to second generation. Furthermore, all or at least a large proportion of disparities in reading competency can be explained by differences in economic and cultural capital, the last being slightly more important than the first.

Can religious education be meaningful? A descriptive study of a teaching experiment in RE

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This qualitative study investigates Finnish upper secondary school students’ perceptions during stimulated silent reflection tasks in religious education classes. This topic is important as we lack rigorous empirical research on classroom pedagogy and on the lived experience of religious education. The concrete research questions were: (1) What kind of reflection content relevant silent moments stimulate among students? (2) In what ways the students find the content matter significant after different stimulated reflective tasks? This a first-stage explorative study from a research project on existential sensitivity in education. The data was collected in an Evangelic-Lutheran religious education course. One class (N = 23) of upper secondary school students (16-17 years of age) participated in the study. The students reported experiences of all categories of spiritual sensitivity: awareness sensing, mystery sensing and value sensing after the stimuli lessons.

Teachers as moral democratic authorities?
Teachers behaviour in schools does influence pupils morally. This happens through what teachers do in classrooms and what they say. Teachers standing in their job can be described as authorities or experts. Moral authority seems to consist in two kinds of abilities, the first kind being a practical ability, the ability to be sensitive to a particular context, take decisions that students accept. The second ability is an intellectual ability, having knowledge of an area, issue or subject and being able to formulate it in such a way that others can understand. These two kinds of abilities are necessary parts of the moral authority of teachers. My main questions in this paper are two: Can teachers be moral authorities? Can teachers be democratic moral authorities? Teachers working in a public school system are endowed with the trust of their communities. Nowadays most national communities in Europe are democratic. If teachers can be moral authorities then there does not seem to be any problem with them being democratic moral authorities. This is not obviously true. To be able to give affirmative answers to these questions it will have to be argued that the very idea of moral authority makes sense, that the notion of moral authority in a professional, educational context in a democratic society can be made clear. This is a theoretical, philosophical paper, investigating the concepts used, analysing them in order to reach clarity about the issues.

Teaching moral issues in the domain of humans and genetic. A content analysis of textbook analyses

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What should be the principles for values education in the field of genetics and humans in science education? This question is raised by doing an interpretative content analysis of twelve analyses of textbooks for genetics and related topics from the period 2003-2012. The analysis is based on literature about scientific literacy/socio-scientific issues, teaching and learning in the field of genetics and ethics, and on selected sources from the moral and democratic and values education field (i.e. ‘the double assignment’), and literature of more general character. We focus on these content categories: (1) ethical/ value/ ideological/ aspects; (2) genetics topics related to humans; (3) interdisciplinarity as an approach valued or not. Based on the outcome of the analysis we have identified four more or less mixed educational strategies or models for handling the fact-value issue: (a) The traditional academic model without explicitly raising value questions; (b) the ‘hand-over-strategy’ by letting socio-scientific issues be discussed in other subjects or contexts; (c) to encourage values discussion in the context of science education without involving other school subjects; and (d), to let science education collaborate in interdisciplinary exchange. Our limited purpose is to lay elements of a knowledge base for the more holistic discussion that should follow about criteria for
responsible teaching. Depending on various context factors and under certain conditions strategies (b), (c) and (d) might all be argued for as preconditions for successful teacher education programmes designed to promote accountability in students.

**Education for sustainability: Teaching English and mathematics using Ethical Dilemma Story Pedagogy**

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This presentation addresses part of a 3-year project funded by the Australian Research Council (ARC). The goal of the project was to investigate how ethical dilemma story pedagogy can be used by teachers to embed ‘education for sustainability’ into mainstream classrooms. Here we focus on two very experienced teachers of secondary mathematics and English who co-developed and co-taught ethical dilemma stories to create an integrated Mathematics-English curriculum. The multi-paradigmatic research methodology consisted of (a) critical ethnographic methods of participant classroom observation, interviewing of students and teachers, and analysis of students’ project reports, and (b) a survey of students’ perceptions of the extent to which they experienced a values-oriented classroom learning environment. The qualitative data were subjected to in-depth grounded-theory analysis, the results of which are the focus of this presentation. Elisabeth and Peter were chief investigators and their roles included that of professional development facilitators. The results indicate that ethical dilemma pedagogy offers teachers an effective tool for challenging students to accept responsibility for their actions and decision-making in relation to issues of environmental sustainability. Ethical dilemma pedagogy provides innovative teachers with an avenue for embedding education for sustainability into mathematics and English, as well as for successful curriculum integration across these traditional subject boundaries. Teacher interviews revealed passionate and creative engagement in professional collaboration. Student interviews indicated promising development of critical thinking, critical reflection on personal responsibilities, and critical classroom discourse about sustainability issues.

**Effects of an Interdisciplinary Approach to Advance K-5 Science Learning and Literacy Development**

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This series of multi-year studies addresses a compelling and well-defined need to improve STEM learning and literacy development for K-5 students in a manner that facilitates positive transfer effects to middle school and beyond. Based on the pattern of achievement results in science and reading comprehension, implications are offered for specific curriculum policy changes. These include increasing time allocated to science instruction in grades K-5 as a means of raising expectations for and advancing STEM education and addressing the goals of the new K-12 Science Framework (NRC, 2011) and the Common Core Standards in Reading/Language Arts.
Learning elementary physics with abstract and concrete simulations

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This paper describes two experimental studies that investigated whether and how the perceptual concreteness of simulation elements can affect students’ learning and transfer in elementary school context in the domain of electricity. Students (10- to 12-years-old) constructed and studied electrical circuits in two different simulation environments. In the concrete condition (CC) simulation elements remained perceptually concrete (circuits with bulbs) throughout the experimentation, whereas in the fading condition (FC) the elements switched from concrete (bulbs) to abstract (resistors) during the experimentation. Procedure was identical in both studies: students took a subject knowledge test before and after the intervention; based on pre-test scores, the students were placed evenly into the two leaning conditions. During the intervention, the students had 90 minutes to construct and study a fixed amount of electrical circuits; same circuits in both conditions. The results of Study I (N = 52) showed that CC outperformed the FC in the post-test. It appeared that the abstract elements made the inquiry process more difficult in FC and hindered learning outcomes. Delayed switch from bulbs to resistors paid off in Study II (N = 125): the inquiry process in FC became easier and learning outcomes better; no overall post-test differences were found between CC and FC. However, there were still differences, in favor of CC, within different grade levels. The results of the two studies suggest that the implementation of abstract items in a simulation environment appears sensitive in elementary school context, and the assumed benefits of idealized representations are not obvious.

Biology Teachers' Professional Knowledge on Handling with Diagrams

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In today’s media age visual literacy is getting more and more important and can be considered as one of the key competences. The correct handling with diagrams is an important skill in school but also in everyday life and in academics. Based on the current literature on diagrammatic knowledge and teacher professionalism, graph-specific skills of the professional knowledge dimensions (pedagogical knowledge, content knowledge, pedagogical content knowledge) are identified. (Future) science teachers should learn how to use such graphs in their lessons more efficiently by having a sound knowledge of the rules for the construction and interpretation of diagrams, so the pupils’ difficulties with diagrams can be reduced. In addition to the identification of these skills, we have developed subject-specific tests to measure these abilities. The first pilot study (N=218) tested the students’ content knowledge (CK) on scientific diagrams and the second pilot study (N=68) focussed on the pedagogical content knowledge (PCK). In the upcoming main study the CK and the PCK of biology
teacher students from about 15 German, Austrian and Swiss universities will be tested and compared.

Effect of argumentation prompts on students’ performance on physics problems

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Studies have shown that embedding scientific argumentation in problem solving can enhance problem solving skills. However, research has also indicated that students have difficulties constructing arguments without appropriate scaffolds. We investigate the use of argumentation scaffolds on students’ argumentation and conceptual quality of solutions to physics problems. In this mixed method we compared students’ performance in two guided conditions: constructing an argument, evaluating two arguments, and one control conditions. Our results indicate that the use of guiding prompts improve the argumentation and conceptual quality of students’ solutions. Further, students in the guided conditions tended to use more sophisticated problem solving strategies than in the control condition. These results have implications for the use of these kinds of prompts in problems in introductory physics.

The contribution of individual differences to the development of YL’s listening performances

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The present study discusses the results of a longitudinal project examining the development of listening comprehension and the role of individual differences in this process in early language learning context. We aimed at exploring how language aptitude, motivation, attitude, the use of listening strategies, beliefs about language learning and listening anxiety are considered as decisive variables of individual differences (Djigunovic, 2009) relate to each other and to the learners’ performances on listening measures. The primary objective of the present study is to focus on the relationships between learners’ performances in English listening tests and the above listed variables of individual differences to present how these variables interact with the level of listening skills, and to what degree these individual differences explain the learners’ success in listening tests. A total of 150 five and six graders (79 boys and 71 girls) participated in the research. The findings of the two-round assessment process clearly indicate that cognitive factors especially language aptitude are strong predictors of listening outcomes in early years of language learning, the affective factors also have remarkable contribution to the performances on listening tests, but their rate changes over time and is sensitive to language learning context.

Values as basis for epistemic understandings and argument norms of Bedouin and Jewish adolescents

Michael Weinstock
Researchers of personal epistemology have posited that people view knowledge as objective ('absolutist'), subjective ('multiplist'), or an integration of subjective and objective aspects ('evaluativist'), with a presumed development in that order. Adolescents appear predominantly multiplist. Studies have found relationships between epistemological understandings and argument construction and evaluation skills. However, most of the research has been conducted with Western samples. Studies in other cultures have suggested there might be cultural variation in the course of epistemological development and the types of epistemologies. The study looked at group differences and the role of cultural values. 305 Bedouin and 375 Jewish 9th and 11th graders in Israel were assessed for cultural values, epistemological level, and acceptance of argumentation norms. The groups differed by cultural values; Bedouins were more conservative and Jews were more mastery and autonomy oriented. Fewer Bedouins had multiplist epistemologies, and grade-related differences appeared only among Jews. The groups held some different norms of what is acceptable in arguing to justify knowledge claims. Independent of cultural group, cultural values predicted epistemology, and both cultural values and epistemology predicted argument norms. Cultural values and epistemology both appear to play roles in how people view the nature of knowledge and evaluate knowledge claims.

On individual differences in conceptual and procedural knowledge of fractions

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Conceptual change in proportional reasoning: Effects of collaboration, own / partner reasoning level

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Systematic research of instruction-based conceptual change in Mathematics and Science is characterized by examining the effectiveness of a particular instructional principle in isolation. For example, much research in the 1980s and early 1990s focused on how different dyadic compositions (e.g., ‘wrong’-'right’) would affect conceptual change, albeit with inconclusive results overall. It is suggested that the field could gain from studying how different instructional principles interact when they are combined in learning activities, instead of studying them in isolation. In the present paper, we examine whether the effects of hypothesis testing techniques depend on dyad compositions. In a randomized experiment, 496 9th graders were asked to solve challenging tasks in proportional reasoning. Half of them were given the opportunity to test their hypotheses and received feedback...
on their solutions (correct, incorrect), whereas the other half did not. Students were assigned to one of three initial reasoning levels and either worked alone or in collaboration with a student of low-level, mid-level or hi-level proportional reasoning. The overall picture that arises from the findings suggests that the effects of hypothesis testing on conceptual growth are indeed conditioned by fine-grained differences in dyadic composition.

**Promoting Quality and Equity in Education: A Dynamic Theory**

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This paper provides a critical review of literature on promoting quality and equity in education which helps us develop a methodology that can be used to measure the contribution of teachers and schools in promoting these two dimensions of effectiveness. This paper, also, argues for the need of establishing a theoretical framework to help schools promote quality and equity and a theory based on the dynamic model of educational effectiveness is proposed. To test the proposed theory, we conducted secondary analyses of three longitudinal studies which provided support to the validity of the dynamic model in relation to the quality dimension. Each of these studies attempted to measure effectiveness at different phases of education and different criteria for measuring learning outcomes were used. For each study, separate multilevel analyses concerned with the reduction of the initial gap on achievement in each outcome were conducted. It is demonstrated that there is a close relation between the two dimensions of educational effectiveness. Schools which were found to be among the most effective in terms of equity were also among the most effective in terms of the quality dimension. Some school factors of the dynamic model explain variation on the effectiveness status of schools in terms of both the quality and equity dimension irrespective of the criterion used to measure effectiveness. Thus, empirical support to the validity of the dynamic theory for promoting quality and equity is provided and implications for studies testing and developing further this theory are drawn.

**Effects of Gf and Gc on the development of knowledge and skills**

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Abstract The Investment theory (Cattell, 1987) states that learning in different fields is dependent on a general ability to reason in novel situations (Gf), and that development of knowledge and skill therefore is influenced by Gf, among other things. The Encapsulation theory (Gustafsson & Carlstedt, 2006) makes the inference that Gf is encapsulated in measures of General Crystallized intelligence (Gc) and that information about Gf therefore does not add to prediction of further learning. The purpose of the present study was to investigate the effects of Gf and Gc on knowledge acquisition in different subjects in school. In all 9002 individuals from the Evaluation Through Follow-up longitudinal database were included. A path model was fitted to measures of Gf and Gc. Results showed that Gf had influence on measures of early and late Gc. However, there were no additional effects of Gf on subject grades, which was interpreted as providing partial support for the Encapsulation theory.

Cognitive Profile and Self-regulated Learning: Structural equation modeling of math performance

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Self-regulation does not refer to a single process, but to a group of cognitive mechanisms underlying the ability to self-regulate. The purpose of this study was to understand the causal and correlational paths in a general model of mathematical performance, which encompasses cognitive and motivational factors under specific task characteristics. Three models were tested through Structural Equation Modeling (SEM). Although the three models had a good fit to the data, a more parsimonious model had a better fit, where cognitive profile has a direct and indirect effect on mathematical performance, mediated by subjective competence. Results are discussed according to a model of adaptive learning and recent findings from a process-oriented approach.

What students represent in text and diagrams: Variations according to purpose, task, and language

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The appropriate use of diagrams is considered a powerful strategy in enhancing communicative effectiveness, but little research has been undertaken to understand the processes involved in students’ spontaneous diagram production. The present study examined the relative amounts of information that students represented in text compared to diagrams when taking notes for themselves (self-directed communication) and when constructing an explanation for another person (other-directed communication). The participants were 98 Japanese university students who were provided one of two passages (differing in imageability) to read in Japanese (L1) and then in English (L2). While reading, they could take notes, and were then subsequently requested to produce an explanation of the passage using L1 or L2. As expected, the students represented a higher proportion of information when writing in L1 compared to L2, and in text compared to diagrams. They also represented a higher proportion of information in their notes compared to the explanation they constructed. Interaction effects revealed, among other things, that the students represented more information in diagrams in notes they took while reading the passage of higher imageability in L1. However, when they produced an explanation of that same passage for another person, still using L1, they represented more information in text compared to diagrams. The findings suggest that students may view the functions of diagrams in making notes differently from that in explaining to others. Furthermore, passage features like imageability, and students’ language proficiency, could affect the relative use of text and diagrammatic representations of information in communication.

Do stakes matter? Explaining 9th graders’ performance in low and high stakes math tests

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Since the 1990s, there has been a growing interest in assessing not just curricular achievement but the more general cognitive and affective goals of education, mixing cognitive tasks and self-report questionnaires pertaining to diverse factors believed to indicate readiness for new learning and successful adaptation to the rapidly changing demands of the future (e.g., OECD PISA). Due to their non-curricular nature, such assessments are generally low-stakes at student level but are used for high stakes benchmarking at education policy level, with data dependent on students’ willingness to participate despite no personal ramifications to boost or guarantee their effort. Building on earlier modelling of the relation between cognitive competence, learning-related affective and contextual factors, and school achievement in low-stakes learning to learn assessment, the present study focuses on the relations of Finnish 9th grade students’ (N=6000) cognitive competence, prior achievement (GPA) and various learning-related affective and contextual factors in explaining their attainment in low and high-stakes math tests. While students’ performance in the low-stakes math tasks was largely explained by their non-mathematical reasoning skills with no direct bearing of prior
school attainment, GPA did account for students’ performance in the high-stakes math exam, even if its impact was hardly more than half of that of general cognitive competence as measured in the learning to learn assessment. The impact of the affective and contextual components was fairly weak for both, probably due to their imbeddedness in the cognitive components.

**Relations between problem solving, intelligence, and socio-economic background**

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This paper presents the results of a large-scale cross-sectional assessment covering eight years of development in school. Its main aims are the examination of (1) the developmental tendencies of domain-specific static and domain-general complex problem solving, (2) the differences in developmental levels of domain-specific and complex problem solving between students attending different types of schools, and (3) the changes in the relation between problem solving, parental education and intelligence. The sample of the study was drawn from 3rd to 11th grade students in Hungarian primary and secondary schools (N=2769). The instruments of the study are domain-specific (DSPS) and complex problem solving (CPS) and intelligence (CFT) tests. IRT scaling, four-parameter logistic equations and structural equation modelling were used for the analyses. The reliability of the tests are high, Cronbach-a ranges between .73, and .92. The logistic curve fitted the empirical data well for DSPS and CPS; the coefficients of determination were high (R2=.95 and .91, respectively). The speed of development changed notably in the age range examined and slowed down after 8th grade. Path coefficients between CFT and DSPS were slightly stronger (.49 and .47) in primary and secondary levels of schooling than coefficients between CFT and CPS (.39 and .42), indicating that CFT predicted performance in both DSPS and CPS. Parental education predicted performance in CPS (path coefficients ranged from .02 to .09 in the overall sample model and in each levels of schooling), however it did not yield significant path for intelligence and DSPS.

**Language and theory of mind in school-aged children with specific language impairment**

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Language plays a crucial role in the development of Theory of Mind (ToM). However, there is limited research examining the relationship between aspects of language development and ToM in populations with language disorders. This study aims to examine the relationships of the syntactic, semantic, and pragmatic skills with the ability to understand mental states in school-aged children with specific language impairment (SLI). Twenty-one children with language disorder aged 8-12 years were matched on their chronological age, nonverbal intelligence, and socioeconomic status with 21
typically developing children (TDC). Groups were assessed on a battery of language tasks tapping syntactic, semantic, and pragmatic abilities and an advanced test of ToM. Hierarchical multiple regression analyses showed that in the group of children with language impairments syntactic and pragmatic abilities contributed significantly to predicting performance on the advanced test of ToM. However, in the group of typically developing children, syntactic and semantic abilities made an independent contribution to ToM performance. Theoretical and clinical implications of these findings with regard to the understanding of the relationship between language and ToM are discussed.

Underachievers in secondary school physics: Who they are and how they suffer

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This study addresses the problem of intelligent Gymnasium students who perform below their intellectual potential in the seminal subject of physics. To date, there is almost no empirical research focusing on underachievement in single school subjects. Therefore, in a study with 200 students from higher education (Gymnasium) we intend to gauge the percentage of underachievers in physics. We thus analyze the relationship between students’ intelligence and physics achievement. Likewise we explore the role of various additional student variables including motivation, interest, cognitive learning activities, perceived learning environment, math achievement, and gender. We defined physics underachievement by high intelligence (IQ>115) and low physics achievement, whereas the grades in biology, German, and English have to be above average. In addition to registering physics grades, a newly devised test on Newtonian mechanics is administered to the participating students to obtain a standardized measure for conceptual understanding in physics. In this study we want to determine the proportion of physics underachievers and contrast them with high-achievers and students who underachieve not solely in physics but at school in general. The preliminary data set suggest that the percentage of physics underachievers is 16%, which is double of the percentage of general underachievers. No gender differences were observed. Results indicate that underachievers particularly suffer from uninspiring physics instruction that only scratches the subject’s surface and doesn’t attract their intellect. With the help of logistic regression and latent class analyses, we aim to identify student variables that characterize physics underachievers compared to general underachievers and high-achievers.

Using Eye Tracking to Examine Students’ Overconfidence When Learning From Text

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Research has repeatedly shown that students tend to overestimate their own learning (Dunning, Johnson, Ehrlinger, & Kruger, 2003), which causes poor study regulation and thus suboptimal learning performance. Overconfidence is especially common when commission errors are made: students provide an answer on a test, but this answer is completely incorrect (Rawson & Dunlosky, 2007). Recent studies have revealed that students seem to have at least partial insight into their overconfidence. Thus, even though students explicitly judge themselves too high, they might in part implicitly know they are overestimating themselves. Investigating students’ insight into overconfidence is relevant theoretically and practically, as it will refine existing theoretical stances on overconfidence and could provide a basis for educational interventions aimed at reducing overconfidence. We aimed to explore whether eye movements on a JOL scale reveal implicit knowledge of students’ overconfidence. Our results reveal that eye movements for overconfident judgments differ from eye movements for correct judgments. Students tended to look more at the lower end of the JOL scale for commission errors, even though they ultimately chose a higher JOL (JOL > 3, on a scale from 1 - 5). These preliminary analyses seem to indicate that students have partial implicit knowledge of their overestimation, as indicated by their eye movements. Examining eye movements provides valuable information about the decision process preceding a JOL choice. Implications for self-regulated learning and for educational interventions will be discussed.

High school students’ epistemic understandings when reading and analyzing news text about illiteracy

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High school students’ epistemic understandings when reading and analyzing news text about illiteracy This qualitative research study explores high school students’ epistemic understanding (i.e., beliefs about knowledge and knowing) when reading and analyzing news text on the topic of illiteracy. Twelve participants (n = 12) were interviewed and engaged in a reading activity that elicited their epistemic thinking across five data points. Participants’ responses were coded deductively using Kuhn’s (1999) developmental model of epistemic thinking (i.e., absolutism, multiplicism, and evaluativism). The data points were triangulated to determine participants’ overall epistemic understanding. The five data points included: 1) sorting criteria based comparing and contrasting news texts; 2) ability to identify better ways of thinking in news articles; 3) beliefs about sources of illiteracy knowledge; 4) beliefs about certainty of illiteracy knowledge; 5) epistemic understanding of news reports as a knowledge source. Results showed that most students (n = 8) had evaluativist epistemic understanding when reading news articles on the topic of illiteracy. These results differ from other studies that showed that most adolescent students hold multiplicistic understandings of knowledge.

It’s All about the Attitudes, not the Age: The Role of Future Time Perspective and Goal Orientation
Adult learning is high on the international policy and research agenda. One major reason is the increasing share of older employees, especially in Western societies. However, older employees are often poorly integrated into the workplace and viewed as inflexible, as unwilling to learn, and as having obsolete knowledge, and therefore as not contributing to business goals. Stereotypes in the workplace often ignore positive effects of age and amplify the severity of negative attributions and in turn might have adverse effects on older employees’ employability. In this study, we draw from socioemotional selectivity theory and goal orientation theory to investigate how older white-collar employees’ attitudes relate to their employability. We hypothesize that attitudes about the future time and goal orientation affect employability while age does not. Data were gathered from 117 employees of a Dutch emergency services organization. While a direct relationship of chronological age on employability is often assumed (e.g. stereotypes that propose increasing inflexibility with age), our results show no such effects. Instead, attitudes about future time and goal orientation are what make the difference. This confirms our hypotheses and extends our knowledge of what role age and attitudes play for staying employable.

Multiple goals and educational outcomes in the Chinese cultural context: A person-centered analysis

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Achievement goal research has mostly focused on the mastery-performance goal distinction neglecting that other types of goals may also influence achievement-related behaviour. A better model for examining a wider range of goals is Personal Investment Theory which posits four types of goals—mastery, performance, social, and extrinsic—as important in understanding school engagement or disengagement. We examined whether students with different goal profiles differ in terms of key educational outcomes (learning strategies, self-regulation, and academic achievement). Using latent class analysis, five groups of students with unique motivational profiles were identified. Results indicated that students who were low in all four goals had the worst outcomes. They scored lowest in deep learning, self-regulation, and academic achievement. Students high in all four goals generally had the most adaptive profiles. They scored highest in deep learning,
self-regulation, and academic achievement. They were followed by those who were high in mastery and social goals but low in performance and extrinsic goals. Interesting cross-cultural differences were also found. Findings demonstrate the importance of complementing variable-centered with person-centered analysis and the role of culture in shaping goal-outcome relationships.

**Does Stress Have to Be Bad? Examining Stress and Coping Among Early Career Teachers**

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As part of a larger study of early career teacher motivation and well-being, we examined how student teachers’ (STs) levels of stress are associated with their confidence for, commitment to, and engagement in teaching, general health, and teaching effectiveness throughout their practicum. We utilised a multifaceted definition of stress based on an inverted-U curve to differentiate between optimal and suboptimal levels of stress. Findings showed that optimal levels of stress were associated with greater motivation and well-being among STs than high levels of stress, but not higher teaching effectiveness. In addition, anecdotal data showed that STs reporting high stress reported more stressors, fewer coping strategies, and more maladaptive coping strategies (e.g., crying, not exercising, etc.) than STs reporting optimal stress. There were also qualitative differences in the types of stressors reported by the two groups. Taken together, these findings offer preliminary support for considering a more multifaceted model of stress than has been presented in teacher research to date. Teaching is a stressful profession and teacher stress affects student learning (e.g., Kyriacou, 2001), so efforts to understand more about teachers’ stressors and coping strategies are important. Moreover, statistics indicate up to 50% of beginning teachers leave the profession within the first five years (Ingersoll, 2002). Therefore, supporting STs to develop strategies for coping with stress should help to prepare them for the demands of their chosen career and, ultimately, enhance their well-being, teaching effectiveness, and students’ learning.

**Teaching typologies: Comparisons among US and Swiss preservice teachers on their teaching motivation**

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In recent years, several international studies have examined the issue of teaching as a career choice as a result of the growing concern for the current teacher shortages worldwide (Author et al., 2012; Watt & Richardson, 2008). The overall goal of this study was to identify and compare different teachers’ typologies based on their motivations for teaching, as well as investigating preservice teachers’ motivations in connection with their teaching views and pedagogical beliefs. Data was
collected using surveys from the US and Swiss preservice teachers (N=810). The US (n=327) and the Swiss (n=483) participants were enrolled in a traditional teacher training program in their respective countries. Study results identified the main teaching motivations across all subsamples as related to participants’ personal values, social values, intrinsic motivation and professional opportunities. Additionally, the identified teacher typologies (their motivational profiles) varied with respect to these motivational factors in the US and Swiss samples. Further, study findings showed that while motivational factors were similar at many levels among the two subsamples, their teaching and pedagogical beliefs were different and varied across the identified typologies. Study implications can help educators understanding the complex interplay between motivations and beliefs and teacher education programs can provide the types of experiences necessary for different typologies teachers as they progress through their teacher training. Study implications are further discussed in relationship with findings.

Is young children’s metacognitive knowledge associated with their error-related brain activity?

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Metacognitive knowledge (McK) is knowledge of one’s self and others’ thinking, tasks, and strategies (Flavell, 1979) is positively associated with cognitive development and academic achievement (Dignath, Buettner, & Langfeldt 2008). Recent research on cognitive control using the ERP technique has examined the neurological processes that occur when people make errors. The error-related negativity (ERN) is a brain response thought to reflect processes involved in detecting errors or response conflict (Gehring et al., 2012), while the error positivity (Pe) may reflect conscious awareness of errors and metacognitive and self-regulatory capacities (Overbeek, Nieuwenhuis, & Ridderinkhof, 2005). In addition, research has shown a link between the ERN and academic performance in college-aged adults (Hirsh & Inzlicht, 2010) and between similar ERP components (e.g., P3) and academic achievement in school-aged children (Hillman et al., in press) suggesting that error-related brain activity may be associated with academic skills in young children. The goal of the current study was to examine the association between error-related brain activity, McK, and pre-academic skills in preschool-aged children (n=36 total sample; n=23 for EEG data). We found a positive association between McK and both pre-academic achievement and error-related brain...
activity. Our results suggest that more metacognitively knowledgeable children have greater conscious awareness of their erroneous compared to correct responses and that this awareness may be associated with greater pre-academic skills. The findings of this study have implications for early metacognitive training, which may enhance error awareness both explicitly (McK) and implicitly (error-related brain activity) and thus could positively influence academic trajectories.

The role of ICT in early childhood education: Results from an explorative teacher questionnaire

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The role and function of ICT in early childhood education is currently a hot topic in both academic and professional practice debates on early childhood education. While some see ICT as a useful tool for learning, opponents fear ICT is a threat to playful learning and children’s’ development. This study explores the visions of teachers working in early childhood education. Based on questionnaire data of 232 teachers, the study distinguishes two types of ICT use in early childhood education: ‘ICT use supporting basic ICT skills and attitudes’ and ‘ICT use supporting contents and individual learning needs’. The first type of ICT use occurs more frequently and is related to the grade of the preschoolers, teachers’ self-perceived ICT competences and the number of years of experience with ICT at school. ‘ICT use supporting contents and individual learning needs’ is strongly related to the grade of the preschoolers, teachers’ self perceived ICT competences, ICT professional development and teachers’ attitudes towards the possibilities of ICT for teachers in early childhood education. Results are based on factor analysis and hierarchical regression analysis, and indicate that professional development is a crucial factor in stimulating ICT use that transcends teaching basic ICT skills and attitudes.

Long-term effects of an educational computer game on early number skills of kindergarten children

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This paper demonstrates a computer assisted intervention for kindergarteners with weak early addition skills. Understanding of basic mathematical contents was supported hierarchically, starting from the numerical base and proceeding towards arithmetic. This was hypothesized to produce long-term effects. In order to control for the effects of maturation and preschool instruction a switching
replications design with two different intervention programs was set. During the first intervention period a treatment group of 6 year old children with weak early addition skills (1.5 SD below mean) was assigned to play daily Ekapeli Math computer game (EM) for three weeks. The results indicated statistically significant intervention effect for Counting Skills ($r = .60$) and Basic Addition ($r = .63$). The achievement level remained stable during 10 weeks follow-up. To examine the specificity of the effect of playing EM, the achievement level was compared to a control group (matched by age and addition skills), which was assigned to play identical amount of Number Race computer game (NR) during the second intervention period. After EM intervention the initial difference between groups in Counting Skills was no longer significant. In Basic Addition there was a significant difference between groups which remained until the second intervention period. The difference did not quite reach significance ($p$

**Preschool domain-specific and domain-general cognitive correlates of arithmetic fluency in grade 1**

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Relations between children’s mathematics achievement on the one hand and their number specific skills and general cognitive processes on the other hand have been reported in both cross-sectional and longitudinal studies. Yet studies that investigate low-level, early developing number processing competencies (‘number sense’) and their relationship to arithmetic achievement are to-date, unclear. More specifically, it is not clear which preschool skills uniquely predict children’s arithmetic fluency in the first year of formal schooling. The current study recorded kindergarten children’s (N = 209) number sense abilities and several domain-general variables. In January of first grade their arithmetic fluency was assessed. Results indicated that, except for non-symbolic comparison, all number sense measures were significantly correlated with arithmetic achievement. Moreover hierarchical regression analysis revealed that children’s arabic comparison, counting and estimation abilities uniquely predicted individual arithmetic differences over and above the domain-general variables. Regarding the general variables processing speed, gender, school attended and time elapsed between pre and follow up testing were unique predictors, but age and nonverbal intelligence were not. The results imply that individual differences in preschool mapping between numerosity and symbolic representation uniquely influence the development of childrens’ arithmetic fluency in first grade.

**Long-Term Remembering from Efficiently Lazy Lecture Preparation by Students**

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Lectures often have a passive feel to learners, because their concrete actions are mostly limited listening. This, and time constraints in modern ways of study may lead to less or no preparation by the students for the content of a lecture thus maneuvering them into a position where sustainable learning is close to impossible. This design-experiment (n=65 teacher students) was conducted within classic lecture and shows that a better and more sustainable learning within classical lecture-like learning settings if learners browse briefly through new learning content before the lecture. It also shows better long-term effects if the preparation is disconnected from the learning experience itself as regards the time of preparation.

**Different Teaching Styles: Constitutive Features of Classroom Dialogue in Mathematics Class**

Jelena Radisic
It is argued how intentional and reflective use of classroom talk provides students with a range of opportunities to develop mathematical thinking; facilitating engagement with the practices of mathematics. Empirical data suggest the most common help students in Serbia seek in forms of private tutoring are related to difficulties in mastering math content; 41% of high school students have additional private tutors in mathematics. The aim of this paper is to describe and analyze how teachers with different teaching styles provide opportunities for their students to develop ideas in mathematics class. Our analysis draws on the concept of communicative approach, which provides a perspective on how teachers work with their students to develop ideas in the classroom. The present paper is part of a larger study investigating interplay between teachers’ beliefs on teaching and learning process and their actual classroom practices. An explanatory mixed methods design was used in an overall study. Results suggest authoritative communicative approach is dominant with the “traditional” and “traditional stressing atmosphere” teacher styles; while the ‘modern’ teacher style allows for attention to be paid to more than one point of view, a position close to dialogic communicative approach. Additionally ‘modern’ teacher style is labeled by an interactive classroom talk. The non-interactive communicative pole is closer to practice of teachers with ‘laissez-faire’ and ‘traditional stressing atmosphere’ styles though attempts of a more interactive approach emerge within some of the analyzed episodes. In the classrooms of teachers belonging to the ‘traditional’ style non-interactive communicative approach prevails.

**Gender, Discourse, and Pedagogy: Examining Gender Differences in Dialogic vs. Traditional Classrooms**

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The purpose of this study was to examine how participation in collaborative dialogic discussions influenced the communication patterns of female and male students in elementary school classrooms. The study used an alternative educational environment called Philosophy for Children (P4C) to examine the relationship between gender and discourse. Using a quasi-experimental research design, we randomly assigned 12 fifth-grade classrooms to two treatment conditions: P4C and Regular Instruction (REG). We analyzed 36 systematically selected discussion transcripts, focusing on various features of classroom discourse. Our results indicate that there were important differences in discourse patterns between P4C and REG students. However, the differences in P4C classrooms were consistent across genders, indicating that P4C pedagogy afforded equal learning opportunities to students of both male and female students.

**Studying Learning Environments in the Discourse Era – vertical and horizontal studies**

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The present paper describes a study which analyzed sixty research papers written by graduate students, veteran school teachers, who participated in the course Literacy as a Dialogue given by me during the last four years. Two groups of papers were identified in this corpus: The first includes papers written by participants who studied other teachers’ classroom environments. The second group consists of self-studies written by participants who studied their own classrooms. The paper analyzes the differences between these two groups of papers and their implications for teaching. The main finding is that the teacher researchers who observed their colleagues developed a vertical (top-down) view of pupil-teacher interactions. Influenced by their ideal of dialogic teaching, they mainly searched for monologic features of the classroom environments which they viewed as obstacles for students’ learning. On the other hand, the teachers who studied their own classrooms provided more complex, horizontal descriptions that were mostly influenced by the circumstances and the dilemmas that the teachers faced in real time. They succeeded in developing more critical analyses of these interactions which illustrated how they transformed the idealized and normative perspective on classroom discourse to one in which dialogue is a context bound way of interacting in the classroom.

Design-Based Research on Interest in Science: An Iterative Comparison of Instructional Designs

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Appreciating the value and the relevance of science for society and everyday life is a crucial aspect of scientific literacy. Theories of motivation specify this aspect in terms of a value component of interest. To promote students’ interest in science some researchers have advocated context-based design approaches based on situated learning theory. This study reports on the first iteration of an ongoing design-based research project aimed at testing and explaining the motivating power of context-based designs in the K-12 science classroom. To this end, educational researchers and science teachers cooperated on the iterative development of a highly context-based intervention designed to deepen students’ appreciation of the value and the relevance of science for different contexts. As part of the first iteration, a design prototype and a revised design were implemented. Results showed a significant improvement in design effectiveness as indicated by observed pre-post changes on students’ self-reports (N=256). The improvement was attributed to a further emphasis on context-based learning activities in the revised design.

Game-based vs. traditional practice in computer-based writing strategy training

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Acquiring a writing strategy usually requires a significant commitment to practice (Kellogg & Raulerson, 2007), which is necessary for writers to automatize their newly-acquired strategy knowledge. However, achieving sustained student engagement with practice can be a challenge. One potential solution is to foster engagement by embedding writing practice in educational games. Currently, there is little research comparing the effectiveness of game-based practice versus traditional practice. Furthermore, few studies have directly investigated students’ perceptions of an instructional game. In this study, the ARCS model (Keller, 1987) was used to investigate the motivational characteristics of different practice conditions. In this way, potential gains of game-based practice in computer-based writing strategy training were examined. 175 university students were randomly assigned to one of four experimental conditions: game-based practice, traditional practice, reading-based, and writing-based practice. All students first learned strategies to write an essay introduction. Subsequently, students practiced the acquired strategies in the four different conditions. Game-based practice was expected to positively affect motivational perceptions of the practice task, which in turn was expected to facilitate strategy knowledge and application of the strategies. Students perceived the game-based practice condition as significantly more interesting and engaging than traditional practice. Conditions also significantly differed on the posttest on strategy application. However, the results suggested that reading-based and traditional practice had a specific, beneficial impact on strategy application. Implications for designing more effective practice tasks in computer-based writing strategy training will be discussed.

On costs of good intentions: The effect of problem contextualisation on knowledge acquisition

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In previous research it has been shown that a semantically familiar problem context can be detrimental to knowledge acquisition. The aim of this study was to test two competing explanations for this effect: goal adoption versus assumptions. Participants were asked to learn about the causal structure of a linear system presented on a computer through goal free exploration. Across four conditions the level of context familiarity was experimentally varied. Results lend no evidence for goal adoption as an explanation for poor knowledge acquisition under familiar conditions. Rather, it appears that a high number of a priori assumptions that tend not to be tested systematically are the main barrier to the acquisition of new knowledge. Implications for research in problem solving, knowledge acquisition and the design of computer-based learning environments are discussed.

Animation in public transports: can it facilitate information accessibility for elderly people?

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Cognitive functions could be affected by aging: speed processing, inhibition abilities, working memory, visuo-spatial abilities. Nevertheless, these functions could also be involved in comprehension of graphic information. In this paper we examined whether in public transports, animated graphic information instead of spoken information, could facilitate the comprehension of disruption messages. Such alternative, could improve public transport accessibility for elderly people by compensating cognitive decline due to aging. Fifty-two participants, two groups of young and older people, were asked to understand and compare series of train traffic disruption messages delivered via three different visual formats. The animated presentation was superior to the two static presentations conditions. This format facilitates the inhibition of irrelevant information by directing attention temporally and spatially to thematically relevant events. The animated presentation helped older participants to establish a spatio-temporal continuum between local events.

Silent music reading: the interplay of prior experience, visual processing and extracted information

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This paper addresses the comprehension of a specific type of visual information, namely music notation. A study on silent music reading combined eye-movement measures with a semantic analysis of readers’ verbal descriptions of the notated music. A group of musical novices and two groups of musical amateurs participated in three separate measurement sessions during a nine-month long university music course designed for future primary-school teachers, in each session viewing a notated folk song for 30 s and then describing what they had seen. Greater musical experience was found to be connected with shorter fixation durations and more linear scanning of the notated music, as well as with more accurate and integrative verbal descriptions. As the course proceeded, a general lengthening of saccades and increase in both accuracy and integrative aspect of the descriptions were observed. Finally, three separate silent-reading styles were discovered: ‘elementary processors’, lacking in both accuracy and integration in their verbal reports, ‘accurate analyzers’, producing accurate but non-integrative descriptions, and ‘accurate integrators’ who besides accurate and integrative descriptions also operated with shorter fixations than the two other groups. Considering that Western music notation is currently a universally applied symbolic system, it is proposed that research on the comprehension of text and graphics could pay more attention to the learning and processing of this specific form of visual information.

Measuring Component Processes in Order to Assess Reading Comprehension

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Multiple component processes contribute to the variance in performance on reading comprehension. It is crucial to distinguish among different sources of failure in reading, for the purpose of providing specific instruction and intervention. Therefore, the Diagnostic Assessment of Reading Comprehension (DARC) (Francis, et al., 2006) was adapted and translated into Dutch. It provides estimates of text memory, text-based inferences and integration of world knowledge with text information. The aim of this study is to validate this test, to explore the relations between the different components of reading comprehension and their contribution to general performance on reading comprehension and to extent the findings by introducing a new component to the test. Participants were 190 children from third and fourth grade of different primary schools. The results of a single-factor confirmatory factor analysis showed that the component processes and the general reading comprehension score intercorrelate in a way consistent with a single underlying dimension. Furthermore, path analyses indicated that prediction of general reading comprehension by knowledge integration was partially mediated by text memory. Influence of making inferences on general reading comprehension was even fully mediated by text memory. Making text-based inferences depends too heavily on textual representations. Therefore, a new component, elaborative inference making, was added to the test to provide a better indication of deep comprehension. We are currently performing extra analyses for this component. The results of this study provide a better understanding of the higher-level cognitive processes underlying reading comprehension and are relevant to tailor fitted training and intervention.

Interaction of Worked Examples and Prompts: Impact on Performance and Cognitive Load

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To investigate the interaction between worked examples and self-explanation-prompts we conducted an experimental study with 73 learners. In the present study we investigated the impact on learning performance and cognitive load. We assume that worked examples and prompts will cause better learning performance, worked examples will reduce extraneous cognitive load, and prompts will foster germane cognitive load. In a mathematical domain after learning, the subjects had to perform analog tasks and transfer tasks. We could show the advantage of worked examples and their reducing impact on extraneous load. For prompts we could not show a significant impact on learning outcome or higher germane load.

Facilitating Function of Animations for Spatial Integration
Considering computer-based spatial learning in domains such as architecture, geography, or anatomy, it was examined whether animations facilitated the mental integration of detail information with spatial locations. Zoom-like animations linked locations with detail information that could be found at the locations within a larger spatial structure. Animations were compared to static pictures that provided the details and locations separately. Participants were presented with three or four location-detail combinations and attempted to integrate them into a coherent mental spatial structure. Participants then decided at what position a particular partial structure (containing two of the detail-location combinations presented) could be found within the larger spatial structure. Accuracy measures reflected difficulty (three vs. four combinations) and showed an advantage of zoom-like animations over static pictures. Moreover, an advantage of individuals with high visual-spatial working memory (VSWM) capacity over individuals with low VSWM capacity was found. These results were qualified by an interaction suggesting that the animations were particularly beneficial for the low-VSWM capacity individuals but only with the easier version of the task. Reaction times reflected the difficulty of the task only. It is concluded that focused animations can facilitate spatial integration processes.

Mindfulness Training Reduces Stress and Burnout in Public School Teachers

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The purpose of this study is to present results regarding the feasibility, efficacy and dose-response relations associated with two randomized-control trials of a mindfulness training (MT) for public school teachers aimed at stress reduction and resilience enhancement. The main mechanism by which the intervention aims to help teachers reduce stress and burnout and enhance resilience is the cultivation of mindfulness and self-compassion. Mindfulness has been defined as a threefold skill-set that includes focused attention, mindful awareness of the present moment, and non-reactivity to and non-judgment of present moment experience emotionally and cognitively. Two pre/post/follow-up field trials of this MT, taught by the same instructor, took place in Canada and the United States during 2009-2010. Results showed 93% of teachers completed the program and found it beneficial. Teachers randomized to MT reported greater mindfulness, working memory capacity, and self-compassion and lower levels of stress and burnout at post-program and follow-up compared to controls. No statistically significant differences due to MT were found for measures of blood pressure, resting heart rate, or cortisol although the effects for cortisol were in the predicted directions. Mediational analyses showed group differences in mindfulness and self-compassion at post-program mediated reductions in stress and burnout at follow-up. Dose-response relations, as well as the implications of the results for improving teaching through high quality teacher professional development will be discussed.

Using O*Net to Analyze Entrepreneur’s Competence

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A coherent classification in order to link entrepreneurial challenges and individual dispositions does not exist in entrepreneurship research, yet (Braukmann, 2008). However, it is indispensable to conceptualize ‘entrepreneurs’ competence’ (Weinert, 2002) to formulate curricula, design instructions as well as run assessments effectively and efficiently in entrepreneurship education programs Therefore, we conduct an extensive literature review to identify facets of entrepreneurial competencies that support new venture success. We analyze 136 empirical studies. Multiple research streams are reviewed including educational, sociological, economical and managerial journals and articles. The facets are classified within the content model of the occupational information network (O*Net) (Peterson et al., 2001). Dispositions like ‘achievement motivation’, ‘self-efficacy’, ‘networking’, ‘adjustment’ and ‘independence’, are the most characteristic ones of entrepreneurs and important for their success. Thus, we are able to give meaningful implications for the development of entrepreneurship education programs and future research dedicated to competencies of entrepreneurs (Pellegrino, 2010, Achtenhagen, 2012).

**Measuring of Competencies in VET/PET. Identification of test content in Business and Administration**

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The major aim of the project is the development of a technology based test environment that follows the principle of ‘authentic assessment’ and is constructed in the context of an integrated modeling of professional competence. The focus of the study is to identify comparable occupational profiles in selected occupational fields and learning outcomes at the end of respective VET programs. As a result the definition of measurement dimensions for subsequent innovative forms of assessment will be provided. Simultaneously, there is a need to learn more about complex situations and its descriptive components to design competence-oriented and innovative assessment tasks. This also includes a deep insight into the modeling and scaling approach, but also a constructive discussion about theoretical assumptions regarding the competence construct that is measured.

**Supporting New Teachers through Peer-Group Mentoring**

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Supporting beginning teachers in early phase of their career is a European, and even a global challenge. In Finland, after an attempt to apply a traditional one-to-one mentoring model in early 2000’s, the development has been towards organizing mentoring in groups (Heikkinen, Jokinen & Tynjälä, 2008, 2012). The peer-group mentoring model based on the socio-constructivist view of learning and the model of Integrative Pedagogy (Tynjälä, 2008; Heikkinen et al., 2012) is currently being disseminated through a nation-wide consortium of all teacher education departments in Finland. The aim of the present study is to answer the following research question: How do teachers experience peer-group mentoring? Data was collected from group participants (n=140) using online questionnaires and interviews (n=14). The findings of the quantitative and qualitative data show that peer-group mentoring (PGM) strengthens the agency of young teachers and supports their professional identity as autonomous teachers. PGM is experienced as a forum with an open and confidential atmosphere, peer support, partnership, encouragement of colleagues and opening up tacit knowledge. Many new teachers report that through interactive and collaborative learning they are more able to find their own solutions and their individual ways to work. They also report that their commitment to their school community has deepened and they feel better equipped to establish links with the community and its members. Altogether, it seems that the mentoring process helps new teachers to find their place in the school community.

Development of an instrument that measures observable leadership behavior

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With respect to professional learning for leaders, ethical leadership has come to the forefront of leadership research. Several scales have emerged that attempt to define and measure ethical
leadership. However, these scales fail to distinguish between ethical leadership traits, attitudes and behavior, and to comprehensively capture ethical leadership behavior. As a consequence they are limited in their usefulness for professional learning. To address the need for more precise measures of ethical leadership, we operationalized ethical leadership on the basis of Frey’s leadership principles (1998) which specify performance aspects that can be applied in professional learning (e.g., in development centers or scenario-based assessments). The principles combine performance-oriented (e.g., goal-setting) with ethical (e.g., treating others with dignity) behavioral leadership aspects and describe behavior in the daily interactions between the leader and its employees, e.g. when providing feedback. (In addition we conducted a thorough review of 10 frequently used leadership scales with a total of 325 items. All items were carefully reviewed according to their match with the principles and the extent to which they reflected a behavior-orientation. New items were created when deemed necessary and a behavior-oriented measure was developed. In further research the items will be validated in an international study.

Professional development in academia: time to change the tune

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At German universities the systematic development of academics’ leadership and social skills was rather neglected in the past. Nowadays professors are increasingly required to manage leadership issues next to their traditional roles as a scientist and teacher. Owing to an apparent lack of systematic approaches to leadership development in academia, in 2007 the LMU Center for Leadership and People Management was established. The Center offers academics a systematic and evidence-based training program in leadership and social skills. The aim of our research is a comprehensive program evaluation to demonstrate the effectiveness of the Center’s leadership courses on the four evaluation dimensions of Kirkpatrick (1994) with well-established scales. Preliminary data analyses showed positive reactions to the seminars, high means in learning effects and a high motivation of the participants to transfer the seminar contents to their workaday. Furthermore, results of t-tests suggest that six weeks after the courses the participants displayed a clear increase in their levels of awareness of their own role as a leader and of role demands ($d = 0.4$). Our research is closing the gap in leadership research in the specific context of universities. We were able to demonstrate that it is possible to sensitize academics for their role as leaders and the respective role demands with trainings. This result underlines the importance of investing in the education of academics’ social skills beyond classic professional and methodical competences.

Understanding the Role of Time in Collaborative Learning: A Mixed Methods Study

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Groups are today's learning units in higher education. Unfortunately, there is a lack of knowledge of what happens in the ‘black box’ of collaborative learning groups over time. This mixed methods study explored how socio-cognitive learning processes developed over time. The quantitative study measured how socio-cognitive processes developed within three periods in the first 18 months. Next, a qualitative study using semi-structured individual interviews focused on detailed development of socio-cognitive processes driving collaborative learning during one period in seven tutorial groups. The hierarchic multilevel analyses of the quantitative data showed that a varying combination of group processes developed within and over the three observed periods. The qualitative study illustrates development in psychological safety, interdependence, potency, group learning behaviour, social and task cohesion. Two new themes emerged: ‘transactive memory’ and ‘convergence in mental models’. The results indicate that groups are dynamic social systems and practical implications are discussed.

**Expert teacher: the nature of expertise in the teaching profession (in FLT perspective)**

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The paper aims to present selected results of the first two phases of a three-year research in teacher expertise and expert performance. Research aims include formulation of criteria for expert teacher identification, systematic analysis of the nature of expertise, and of the processes and determinants of expertise development and maintenance. Research in expertise perceived as a stable high-level quality of performance acknowledges interdisciplinary character of the construct and paradigmatic plurality within relevant scientific disciplines. Multiple-case study utilising combination of methods is considered an appropriate research design for such a phenomenon. The empirical research includes three main phases. The first phase focuses on the nature of expertise and expert performance through direct observations and consequent analytical interviews, the second one on cognitive representations of expert teachers through an introspective method (video-based stimulated recall and protocol analysis), and the last one aims to shed light on the processes and determinants of teacher development (biographic research). For the first research phase specific data collection instruments were designed and piloted deploying theory and research-based categorical system. The data analyses served two purposes. Firstly, the data obtained were analysed in order to discriminate, i.e. to select the cohort for the second phase. Secondly, we focused on the nature / characteristics of teacher expertise; the results of factor analysis pinpointed three main factors, closely linked to the
socio-emotional and knowledge-related dimensions of teaching performance, and also insight. Thus, partial results of our research correspond to the prototype view of teacher expertise.

**Investigating the quality of online discussion with the aid of multi-phase analysis method**

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The aim of this study is to understand the quality of online discussion, especially from the perspective of the level and reciprocity of discussion. Participants of the study were Open University students (n=27), divided into four groups, and studying in distance learning course utilizing asynchronous learning platform. The data sources included participation logs, web discussions and the grades given by the teacher. The analysis method combined quantitative and qualitative approaches that together formed the overall picture of group differences, individual levels explaining them and the context into which high-level discussions were embedded.

**Team Effectiveness in Collaborative Learning in Higher Education**

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Collaborative learning is an often used pedagogical approach in higher education. In such cases, team effectiveness is conditional for both team performance and learning quality which in turn requires the learning-team to develop from a group of individual students into a team. Based on a validated conceptual framework, a number of case studies and cross-case analyses were carried out and data were collected through questionnaires, interviews and analysis of the team communication. Results showed the importance of developing shared mental models as a learning-team in an early phase of collaboration to become effective as a team. Due to an approaching deadline learning-teams pass through a transition phase in which task and team strategies are being adapted to deliver final results in time. In learning-teams where shared mental models were not developed before the transition phase, the team cannot adapt their strategies since team members lack the common understanding to do so. In ineffective learning-teams either centralized autocratic leadership is likely to emerge to deal with the critical situation or learning-teams probably expect the teacher/tutor to show directive leadership behavior. Complete results will be presented at the conference. The research contributes to our understanding of the dynamics of teamwork in collaborative learning in higher education, and more specifically which variables mediate learning-team effectiveness in what way during the whole process of teamwork.

**Individual and collective analysis of the Technology Acceptance Model in a collaborative task**

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In a virtual campus, by referring to the Technology Acceptance Model (TAM), the aim of this study is to compare the acceptance of different collaboration tools (e.g., Wiki, forum, chat, ..) for a collaborative writing task at an individual level of analysis and at a team level. In TAM model, Perceived Usefulness (PU) determines one’s behavioral intention to use tools and the Real Use (RU) of it (Davis, 1989). PU is influenced by Perceived Ease of Use (PEOU) because the easier a computerized learning tool is to use, the more useful it is. To assess these expectations, the real use of collaborative tools during an authentic task in a virtual campus is analyzed in 84 master students gathered into 23 team of work. At the individual level, we only observe a positive relation between the Perceived Usefulness (PU) and the Real Use (RU) of the wiki for constructing knowledge. At the team-level, we also observe a relation between the PU and the RU of the wiki for constructing knowledge, but also for writing objectives; the Previous Experience is related to the use of the chat both for writing and for general purposes. We discuss the results on the differences found in acceptance at the individual and team-level in relation to the task and the implications of the enhancement of the learners’ acceptance in online collaborative writing activities.

The model of argumentative knowledge construction: knowledge acquisition by argumentation

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Online discussions serve to facilitate active participation of students in university lectures and seminars. However, learners are often side-tracked from the relevant content, they do not provide reasons for their claims, or they do not refer to and build on contributions of their learning partners. How are specific characteristics of online discussions related to individual knowledge acquisition? We present and empirically examine (N = 108) a theoretical model of knowledge acquisition through argumentation in online discussions, namely the model of argumentative knowledge construction. We examine the relations of characteristics of the online discussions (i.e. quantity of participation, quality of argumentation, and epistemic activity) with domain-specific knowledge acquisition. Our findings support the model of argumentative knowledge construction. Argumentative quality enhances epistemic activities, which, in turn, fosters domain-specific knowledge acquisition. Hence the model of argumentative knowledge construction can be used to analyse and specifically support knowledge acquisition in online discussions.

Peer Learning and media literacy: participatory instruction to foster media literacy in schools

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his study examined the experience of 40 secondary students and 20 teachers enrolled in a peer-education program to enhance media literacy. The use of peer education to promote media literacy is not widely spread. In this project, a peer-learning project was implemented in schools to strengthen the role of learners as experts in their own digital environment and to build up a peer-to-peer learning environment in school. The main goal behind this project was to analyze the set-up a peer program needs to be successful to enhance students’ media literacy. The research questions were: What are competencies student must have to take responsibility of teaching processes? How much guidance or formal structure students need to keep peer-learning alive and how does students take over participation of their own learning process? To analyze the peer-process and the competences during this project a formative triangulation design has been set up. Interviews and online surveys were quantitatively and qualitatively analyzed to explore students and teachers experiences during this process. Results indicate that students take responsibility for media literacy of their peers and in school as well and that the project enhances the participation in school.

Why Students Need Training to Cooperate: A Test in Statistics Learning at University

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Cooperative learning is a powerful tool for learning, but its implementation faces several obstacles: a general competitive environment that make it necessary to ‘train’ university students to cooperate. Moreover, the mediational role of competence perception has received little investigation. Training in cooperative learning should increase students’ competence perceptions, and in turn their learning outcomes. Previous methods involve long and demanding training. Our approach based on the enhancement of competence perception allows hypothesising that positive gains may be obtained even with a short and simple intervention; this has been done in the challenging domain of statistics courses for psychology students. One hundred and eighty five first-year psychology students participated in the study for 90 minutes (one session). During a statistics workshop involving a training phase and a subsequent individual learning post-test, we compared three conditions: individual learning, cooperative dyadic instructions (structuring the three basic components of cooperative learning) and cooperative dyadic interactions (the three basic components, plus value of cooperation for learning and short training of cooperative skills). Results indicated a linear trend in individual post-test learning from individual training to cooperative instructions, to cooperative interactions. The linear contrast was significant, whereas the orthogonal contrast was not. A similar trend was found for students’ competence perception. Finally, competence perception mediated the effect of training on learning. This theory-based intervention
revealed the importance of training students to cooperate for competence perception and learning, and underline that learning gains are possible even in difficult contexts.

**Exploratory talk in university mechanics course recitations**

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The main research aim was to find out to what extent different forms of talk, and especially exploratory talk, emerge in small group discussions in university level mechanics instruction. We also examined whether certain types of exercises have an effect on the type of talk. The data collection was conducted within an university-level mechanics course. The participants were mostly consisted of first year physics students. The recitation sessions were video recorded with two video cameras with which we received the overall picture of the recitations. The group discussions were audio recorded with a digital audio recorder. The data analysis focused on the interactions in recitations and the framework introduced by Mercer (2000) was selected for analyzing and interpreting the interactions. Data analysis was done at the episode-level. Episodes were defined by considering entities of exercises usually aligned with a certain talk type. We found that cumulative talk was clearly prevailing in recitations, exploratory talk was detected in 4 exercise-tasks from a total number of 96 and that exploratory talk took place when discussing conceptual matters rather than purely calculative exercises. The results of this study reveal that although students were actively taking part in discussions in small groups through cumulative talk, the creative and critical argumentation was too infrequent to be exploratory talk. Communication skills should be explicitly addressed and practiced before expecting students to adopt these skills as part of their interaction and to deepen their understanding of physics.

**Effects of enhancing tutors with two competences on tutees’ cognitive load and task performance**

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This study investigated whether specific tutor competences can alleviate tutee cognitive load and can assist tutees to work effectively on a complex task of making arguments. We carried out an experiment to compare two tutor competences: i) content knowledge on a particular topic versus ii) tutoring skills of task processing and pedagogical skills. Four classes of pre-university students
participated in this study. Tutors received training and had access to written instructions during tutoring. Their prior knowledge and tutoring skills were measured. Tutees had to take a stance on a statement, and back it by three arguments. Tutors supported tutees during this task by using relevant written instructions. After task completion, participants reported task cognitive load on the NASA-Task load Index, took a post-test, and filled in an evaluation questionnaire regarding the tutoring process. Results showed that tutees supported by tutoring skills tutors experienced a lower cognitive load and performed significantly better on the post-test than tutees supported by content knowledge tutors. Contrary, tutees supported with tutoring skills tutors were slightly less satisfied with the tutoring process than tutees supported with content knowledge tutors.

**Doctoral Students’ Progress in Studies and Coping with Occupational and Family Responsibilities**

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Participation in doctoral studies has increased in recent years in many countries. The growing number of students and their different expectations of PhD studies challenge traditional ways of arranging study programs. In the current study, we focus on how PhD students in Estonia succeed in combining their studies with other major responsibilities. Specifically, we aimed (a) to gather information on the relationship between study progress and occupational and family responsibilities among PhD students; and (b) to investigate the types of meanings and coping strategies that doctoral students attribute to combining academic and non-academic domains of practice. A survey (N = 140) was conducted among PhD students to provide information on the first question, and a small-scale qualitative study (N = 18) was used to answer the second. The results suggest that many students in PhD programs have slower study progress and that this exists in the context of occupational responsibilities, indicating that the current study arrangements in Estonia might not be best suited for supporting the studies of these students. Based on these results, we provide some suggestions for enhancing study arrangements for doctoral studies.

**Enhancing creativity through mental visual synthesis: A case of the ‘less is better’ effect**

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According to the association views of creativity, the production of original ideas is achieved through unusual combinations of known elements. Finke showed that creativity can be induced by asking people to mentally assemble simple figures into a whole image. The simplicity of this procedure is consistent with what Chua and Iyengar reported showing: giving people high choice of initial resources does not lead to more creative outcomes. We wondered if starting stimuli which are poorer or richer affect the creative process. Persons are induced to combine some figures mentally and to invent new products or find new ideas. The task was based on a series of three simple figures (triangle, circle, square). In the first condition (poor stimuli), subjects saw three words, indicating the figures. In the second condition (standard stimuli), the participants saw the pictures of the figures. In the third condition (enriched stimuli) participants saw the figures changing in size and rotating. Participants had to draw on paper the image they had mentally synthesized. Findings indicated that in the first condition children produced a higher number of attempts to get more creative invention and tended to produce more original ideas than children in the other conditions. It appears that the use of poor content leads to the discovery of unusual images, presumably because it guides the thought processes in a more creative direction. This conclusion may be useful in education: teachers can draw upon to present tasks with less creative content, so that is developed by the children.

PhD. students’ ideas about academic writing in two countries

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This study aimed to measure PhD students’ ideas concerning writing in two different countries and how they saw themselves as writers. The participants of the present study were 1570 PhD students from Finnish and Spanish universities. They volunteered to fill in The Writing Process Questionnaire that was validated in a previous study (Lonka et al., 2012 submitted). The study covered scales for measuring six distinct theoretical constructs that were created by forming sum variables of 26 questions: Blocks, Procrastination, Perfectionism, Innate ability, Knowledge transforming, and Productivity. Exhaustion, stress, anxiety and lack of interest were used as criterion variables. All these malfunctional affects correlated positively with Blocks, Procrastination, and Perfectionism, and negatively with Productivity. The alphas for the scales were satisfactory or good in both countries. Only Knowledge transforming needed to be modified to improve the alpha. The exploratory factor analyses showed the same six-factor structure of the writing scale for Spanish PhD students that was previously confirmed. It appeared that the instrument can be used in both countries and it works in both languages. There were significant differences between Spanish and Finnish PhD students. The
most striking difference was a very high level of exhaustion in Spanish students. The educational implications shall be discussed.

Writing Conceptions and Their Relation to Emotions: A Study With Spanish PhD Students

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There is little literature relating conceptions about writing and emotions. With the purpose of adding some light in this field, 631 Spanish PhD students answered The Writing Process Questionnaire (Lonka et al., 2012 submitted) using four extra variables concerning dysfunctional emotions. After a step-wise cluster analysis and various ANOVA tests three clusters (writing conception profiles) were identified: adaptive (36%), medium (40%) and maladaptive (24%) student groups. Adaptive students displayed significantly lowest levels of stress, anxiety and lack of interest; maladaptive students just the opposite, and medium students displayed medium levels. The only exception was for exhaustion in which no significant differences were found between the second and the third group (in fact all three groups reported very high scores). Our results suggest that there is a clear relationship between writing conceptions and emotions.

Measuring change in PhD candidate attributes during candidature

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Recognising the inherent complexity of doctoral studies, this study investigated candidate differences in affective, intellectual and contingency responses to their PhD candidature, through the use of self-report measures. Responses to an on-line survey by a total of 1047 candidates at 34 of the 39 Australian universities were obtained on two occasions, one year apart. Three clusters of candidates were identified based on their initial set of responses to the 18 measures. The first group (n=317) responded most positively to the measures, the second group (n=223) were less positive than the first but were strongly focussed on coping, and the third group (n=455) were clearly having difficulties but apparently were not addressing them. Differences over one year in the scale scores for the 18 measures were then compared for the three clusters of candidates, and these were then related to their stage of candidature, age of candidate and discipline area. Overall, there were few differences for candidates in any the three clusters on the 18 measures by stage of candidature, age and discipline.

**Behavioural sciences doctoral students’ engagement in the doctoral work**

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What kinds of experiences keep doctoral students engaged in the demanding process of earning a PhD? Our recent research on doctoral experiences indicated that not only developing domain-specific competences, but also participating in scholarly community and experiences of being its member contributed to students’ engagement in the doctoral process (Tuomainen et al., submitted). In turn, lack of such experiences was typical source of disengagement (Vekkaila et al., submitted). However, little is still known about the nature of doctoral students’ engagement in their doctoral studies. This study explored students’ experiences of engagement in the doctoral work. Altogether, 21 behavioural sciences doctoral students from one top-level research community were interviewed. The data were collected with semi-structured interviews, and the interview data were content analyzed. The doctoral students’ experienced engagement manifested itself in terms of dedication, efficiency and sometimes absorption. The students described that the sources of engagement were typically increased sense of competence as researcher and relatedness in the scholarly community. The students less often reported strengthened sense of autonomy and contribution as the sources of their engagement. In addition, three qualitatively different forms of engagement in doctoral work, adaptation, agentic and work-life oriented were identified from students’ descriptions. Further, there was a variation among the doctoral students in terms of what forms and sources of engagement they emphasized in different phases of their doctoral processes.

**PhD candidate reflections on initial expectations of the PhD: mismatch and student satisfaction**

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In the literature, mismatch in PhD student and academic expectations has been linked to attrition, and focusses primarily on negative elements of mismatch. This paper seeks to explore the scope and direction of initial expectations recalled by students and how they responded to any challenges that arose as a result of mismatch. It also explores to what extent mismatch is reflected in satisfaction with candidature. The paper draws on two telephone interviews with 109 doctoral students, held one year apart, and surveys administered at the beginning of the study. The satisfaction of students was generally high, and this was so for the three areas examined: institution, supervision and their own preparation. This did not mean all students were feeling completely positive about candidature and many had experienced significant low points in candidature. We discovered a ‘dark side’ wherein a group of students, initially very positive about a professional future in academe, moved to complete rejection of academic life. Analysis of the interviews led to the identification of broad categories of mismatch relating to ‘task’, ‘personal/professional development’ and ‘supervision’.

Teachers’ and Students’ Experiences of Increasing Interactivity in University Studies

Based on the research findings, interactivity is seen as a crucial ingredient while promoting learning and developing the students’ capacities for active citizenship. Interactivity in teaching is often aspired to by utilising both a student-centered approach and activating pedagogy. Student-centeredness has been considered as the dialogic relationship between a teacher and students. Activating pedagogy refers to teaching practices that promote the students’ participation activity and their possibilities of influencing their study environment. With the aim of promoting interactivity in teaching, five teacher teams developed their courses at the University of Jyvaskyla, Finland during
the 2011-2012 academic year. This study aimed to obtain knowledge about the implementations of these interactive practices by examining 1) the experiences of the teachers about the use of interactive teaching practices, and 2) the students’ views of the course’s student-centeredness and their own involvement in the courses. The data consisted of teacher team interviews (N=5) and a questionnaire for the students (N=210). The data was analyzed using both qualitative and quantitative methods. Both the interviews and the questionnaire showed strong student-centeredness. Some teachers were worried about the students who were not engaged in interactive working. Also according the questionnaire, the students’ involvement in the courses showed lower ratings than student-centeredness. The students’ engagement in interaction in learning situations cannot be regarded as a truism. Therefore, it is important to develop individual ways to support inactive students in order to promote their learning and capacities as active agents in society and in their working lives.

**Students’ multiple goals: A review of studies examining achievement goal orientation profiles**

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The multiple goals perspective, the idea that students can and do pursue multiple goals simultaneously and to varying degrees, is widely accepted among goal theorists and has prompted numerous studies. The aim of this study was to review studies examining achievement goal orientation profiles or groups. We reviewed 46 studies and investigated what kinds of profiles have been extracted and which profiles have been shown to be most adaptive with respect to academic and socio-emotional functioning. The use of different conceptualizations and methods, as well as participants of different ages and from various educational contexts make the interpretation and generalization of the results difficult. Even though there is no consensus on the number and composition of profiles or groups, the following profiles are commonly identified: predominantly mastery, predominantly performance, high-mastery/high-performance, and low achievement goal profile. In studies including a work-avoidance orientation, a work-avoidant profile is usually identified. Some debate also exists about which combination of goals leads to the most adaptive outcomes. Studies have demonstrated support for the merits of mastery-only and high-mastery/high-performance profiles. However, some studies suggest that strivings for performance might, even in the presence of mastery strivings, entail some unfavourable outcomes. Low motivation and avoidance-oriented students manifest the most negative outcomes in terms of academic and socio-emotional functioning. Despite the wide array of studies investigating goal profiles, deeper reflection and interpretation of the findings is scarce. This study addresses the issues of prevalence, functionality, and stability of goal profiles and discusses the advantages of person-centred approach.

**Certainty of career choice during university studies – dynamics of attributions, and career motives**

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The focus of this study is on the dynamics of certainty of career choice in theological field during university studies, and how this relates to students’ career motives and more general strategies and attributions in achievement situations in various study phases. The sample is from a follow-up study of first, third and fifth-year theology students, in which they responded to questionnaires surveying their certainty about career choice, and strategies and attributions in achievement situations. The original motives behind career choice were surveyed only once at the beginning of the theological studies. According to results, contextualised motivational approaches seem to explain better career choice certainty than general strategies and attributions in achievement situations during university studies of theology. These results are discussed from the viewpoint of developing university education with emphasis on dynamics of different curriculum paths of students and potentials of university education to support the process of growing up to be the academic experts desired.

**Teachers’ Goal Orientations and Written Feedback on Student Assignments**

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The concept of teachers’ goal orientation is receiving increasing attention in teacher motivation research. However, research on how teacher goal orientations relate to concrete teacher behaviors is scarce. The purpose of this study is thus to examine the relations between teachers’ goal orientation teachers’ written feedback to student assignments. 139 undergraduate pre-service teachers responded to a multidimensional questionnaire on teachers’ goal orientation including scales for mastery, ability-approach and ability-avoidance, work avoidance, relational, approval, and leadership goals. They also filled in a brief questionnaire on frame-of-reference orientation and were asked to write a feedback comment on a fictional mathematics test for four students with different achievement profiles. Results revealed significant correlations between the length of the comments and social frame-of-reference orientation, as well as all avoidance-dimensions of goal orientation, and with relational goal orientation. In addition, participants with high ability-avoidance or work-avoidance scores rarely addressed errors of student’s work, rarely gave tutoring hints for future learning or test processing, and rarely used personalized, specific comments.

**Execution and brain Activation in children with and without ADHD: A structural equation model**

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From a risk and resilience model, this research aims to analyze the interaction between brain activation variables (nir-HEG and Q-EEG) and executive (CPT) to the student with ADHD. The study involved 499 children, aged between 6 and 16, 256 diagnosed with ADHD and 243 without ADHD. For the analysis of this objective, it has been formulated a causal model in which are included different measures of execution by CPT -TOVA-(inattention, response time, impulsivity, variability, and IGCE), electrical activity Q-EEG and blood activity nir-HEG. The causal model was tested using structural equation modeling (SEM). The model has been built based on three general assumptions: 1) there are different causal model to ADHD children and without, 2) the activation measures influence students’ executive performance, and 3) there are important structural differences between ADHD and control group model. In general, we have found that: a) activation measures influence different types of executive pattern, b) relation between activation variables (nirHEG and Q-EEG) depends on which brain zone are studied and finally, c) with a good fit in models (with and without ADHD), both show important differences in variables correlation. Finally, these results are analyzed based on diagnosis process; therefore discuss some implications and raises future research.

A reading incentives programme for students with disabilities

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The Program of International Student Achievement (2009) and Progress in International Reading Literacy Study (2006) have shown student enjoyment and amount of out-of-school reading to be key factors in high achievement in reading literacy. These strong relationships led the OECD (2010) to recommend education systems encourage reading, particularly in low achievers who are less likely to engage in recreational reading. In 2004 a reading incentives programme, the Premier’s Reading Challenge (PRC), was established in Australia to increase student literacy and encourage enjoyment of reading. Student participation rates in the PRC have increased, but teachers and teacher-librarians views of the PRC for students with disabilities in special classes and schools have not been investigated. A survey of 101 teachers and 46 teacher-librarians in mainstream and special schools in South Australia was therefore conducted. Statistically significant differences were evident between the two groups, with teacher-librarians expressing more positive views of the PRC in increasing students’ reading, giving them a sense of achievement and of the awards offering incentives to reluctant readers. Significant differences were also evident between teachers and teacher-librarians in mainstream schools compared with their special school counterparts in relation to the PRC awards offering incentives to reluctant readers. These results indicate the PRC is a worthwhile incentives programme as it encourages students with disabilities to engage in recreational reading but it would also be advantageous to gain first hand knowledge of teachers’ and students’ views about the PRC through interviews and observations.

Comprehension of temporal and causal connectives in hearing and deaf poor comprehenders

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Connectives explicitly mark logical relations between events or concepts and thus are assumed to aid comprehension, especially in young readers (Cain & Nash, 2011). However, little is known about poor comprehenders’ understanding of connectives (Boureux et al., 2011). The few existing studies suggest that poor comprehenders may have problems also when semantic relations between information in a text are explicitly signaled by these linguistic devices (Boureux et al., 2011; Cain, 2011). Two studies examined poor comprehenders’ understanding of temporal and causal relations expressed by explicit causal and temporal connectives and by the generic connective ‘and’. The performance of poor comprehenders at tasks requiring the understanding of temporal and causal connectives was compared to that of a group of hearing good comprehenders and deaf poor comprehenders matched for grade level. The results suggest that, differently from deaf comprehenders, poor comprehenders do not show a limited capacity to elaborate subordinate conjunctions in general, but may have a specific problem with the elaboration of some logical relations which are cognitively more demanding also for good comprehenders (i.e. temporal relations).

Inclusive Educational Systems in Switzerland - formal frames and actual practice

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In 2003 Switzerland’s new rules for financial compensation obligate cantons to develop concepts of special needs education. Within this context this study examines the legal structure of the Canton of Soleure compared with current practice of actors. Due to its systemic approach a research concept was developed, partly based on Bronfenbrenner’s (1979) paradigm. Research questions address consistency of comprehensions of inclusion within administrative regulations and among actors, differences in comprehension among actors and across issues and, finally, actors’ conformity with their regulatory frame. Data of this study consist of administrative documents and data about current practice of 136 actors. Synthesis of documents is based on structural collection technique, current practice on online questionnaire and interview, data examination on topological network analysis. The results presented focus conciseness of structures of ideas related to topics and perspectives of actors, similarity of structures between different actors, and concordance of current practice with actual regulations. From the theoretical perspective the results account for more differentiated evaluations of concepts of inclusion, highlight from the methodological perspective
new possibilities in handling network related research and contribute from the application-oriented perspective for a better understanding of areas of conflict serving as a basis for improved shaping of communication and collaboration.

**Lessons with an intervention program based on the children’s specific language and reading skill**

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The intervention study Improving language and reading skills in children with German as a first or second language (LARS) evaluates a new developed teaching program regarding its effects on reading and language ability for second grade children with German as a first and second language. To validate the feasibility and applicability of the specific intervention concept and the support strategies as well as the survey instruments, a pilot study was conducted respectively. The results indicate that the learning effects regarding reading fluency and comprehension were significantly higher in the intervention classes than in the comparison classes. To prove these results and the effectiveness of the teaching program, the intervention sample and the intervention period will be extended (for about 50-70 teaching hours). Approximately 450 children were tested this autumn, of which nearly the half will be taught with the intervention program within the following school year. They will reach twice a week texts and corresponding tasks as well as vocabulary exercises adapted to their abilities (four different difficulty tasks at four different literacy levels). Using a pre-posttest design with a control group, the first results of the differentiate intervention of reading and language abilities will be presented.

**Vocational students learn to consider source information when deciding about science controversies**

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When laypeople need to make up their mind about science-related questions, relying on pertinent experts is a well-adapted behavior. This is because truly informed judgments often require specialized knowledge far beyond the level possessed by laypeople. To account for the problem that adults and adolescents nevertheless frequently fail to pay attention to source information (and therefore the sources’ expertise), we developed and tested a class-based training intended to foster students’ consideration of source information when deciding about science-based controversies. Vocational students from a low educational background whose general reading ability was low participated in the study and were allocated to a training group or a control group. Students from both groups read and decided about pairs of science-based texts, whose authors were either both experts or differed in their level of topic-expertise. The results show an effect of the applied training on students’ validity judgments when deciding between both conflicting positions. Students from the training group were more likely to decide in favor of the expert position. Moreover, the training group more frequently referred to the sources’ level of expertise to justify their judgment. Memory for sources was not improved through the training. We conclude that the training primarily taught participants how to use source information when reading about scientific controversies rather than enhancing mere attention to sources. Implications for formal education are discussed.

Development of reading fluency during the second grade in Finnish children

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Problems in reading fluency, especially poor reading speed, are a typical feature of dyslexia, especially in transparent orthographies. The knowledge on the development of reading fluency is still relatively scarce, which is reflected as lack of information on effective interventions or pedagogical practices for supporting readers struggling with fluency. The aim of this study was to assess reading fluency development in Finnish 2nd grade children, with an emphasis on gender- and age-related differences, as well as the stability of fluency during the 2nd grade. Despite steady development in reading accuracy and speed during the school year, the inter-individual differences in especially reading speed were stable during Grade 2. This underlines the need of effective instructional means for supporting reading fluency development in struggling readers. The analyses concerning gender revealed that while there were no differences in decoding skills, the girls outperformed boys in reading tasks requiring reading of text or sentences. This can be hypothesized to reflect very early differences in reading experience and motivation.

The missing link: Why is there no stereotype threat effect on boys’ reading performance?

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When stigmatized group members are in a situation where they are afraid of confirming negative stereotypes about their group, the probability of performance deficits increases. This situational predicament is defined as stereotype threat. Most research on stereotype threat focuses on girls’
mathematical performance so that it is unclear whether stereotype threat has the same effects for boys. As of yet, research shows inconsistent findings as to moderate stereotype threat effects. The aim of the present study was to examine stereotype threat effects on boys’ reading performance as well as the moderating role of gender identification. A total of 188 boys (8th and 9th grade; aged 14 years) from five secondary schools (grammar school, secondary modern school) completed 30 reading tasks in either one of two stereotype threat conditions (explicit: emphasizing of gender differences; implicit: mentioning of a test on verbal abilities) or a non threat condition (nullifying of gender differences). Additionally, they answered two questions about their gender identification. A two-way ANOVA (school form x experimental condition) revealed a significant interaction: Boys from grammar schools significantly outperformed boys from secondary modern schools in both the explicit threat and in the non threat condition, whereas there were no performance differences between boys from different school forms in the implicit threat condition. A moderated regression analysis showed that gender identification did not significantly moderate boys’ reading performance in a stereotype threat situation. Further analyses have to show whether self-concept is the missing link between boys and (no) performance reducing stereotype threat effects.

A latent growth curve model of beginning teachers’ individual competencies

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As part of the cross-national project ‘Alpha’, the classroom instruction of 73 beginning teachers from four teacher universities in Austria, Germany and Switzerland was recorded on video at two different points during their first year of teaching. The observed teaching techniques of the teachers were then rated by experts. A reanalysis of the qualitative rating data led to a reduced competence model. Derived from a confirmative factor analysis, a model with three major teacher competencies - ‘motivating students’, ‘pacing’ and ‘facilitating’, was established. Based on a latent class growth curve model, we found individual differences at the first point of measurement, but no differences in growth. Adding covariates to the model revealed differences in growth. Beginning teachers with previous study experience showed significant growth in the three advanced teaching competencies compared to teachers without such experience.

Professional learning in early childhood: Lessons from the KidsMatter mental health initiative

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This paper evaluates staff’s perspectives about their professional learning during the KidsMatter mental health promotion initiative in 111 selected Australian early childhood (EC) centres. Mental health promotion is a relatively new curriculum area. Furthermore, professional learning itself is a new undertaking for many EC staff. Data for this study included (1) Staff questionnaires collected at four time points (2) Staff feedback about the professional learning and (3) Facilitators’ reports on the quality of implementation of the KidsMatter initiative. Three-level hierarchical linear modeling (HLM) identified gains in staff Knowledge and Self-efficacy in centres rated as high quality implementers of the initiative, but not in centres rated as low quality implementers, highlighting the importance of good quality program delivery. Findings were considered in relation to Desimone’s (2006) framework that includes five core features of effective professional learning. Positive outcomes were associated
with opportunities for staff to engage in content focused, collaborative, hands-on, relevant learning. Problematic features considered likely to compromise program sustainability included insufficient exposure to learning modules and programming difficulties. Implications for future policy and practice for EC staff professional learning initiatives include, clarifying different pedagogical perspectives about training versus professional education; delivery costs and staff time-release in for-profit and non-profit centres; timing of delivery that accommodates the needs of full- and part-time staff; and curriculum design and delivery that addresses a wide diversity of background knowledge held by EC staff.

**Teachers/ lesson planning - Practicability of didactical models**

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Didactical models, such as the Berlin model, the Hamburg model and the Klafki model, are regarded as essential to organize successful learning processes. However empirical studies, which focus on teachers planning habits show a contradictory result (cf. Tebruegge, 2001). No didactical model can be identified examining teachers planning activities (e.g. Haas, 1998). Almost all studies come to the conclusion that didactical models are unpractical, and not suitable for daily use. But there is a lack of studies, which actually examine the practicability of didactical models. In our study a questionnaire was developed in order to get detailed information about the practicability of didactical models. Based on the results of a qualitative study the questionnaire contains four scales: graphical representation, practical orientation, comprehensibility, and content. N=273 respondents had to rate the suitability of different didactical models. Factor analyses confirmed the theoretical assumptions, and analyses of the reliability showed good Cronbach’s r-values (.82

**Teachers’ pre and post course understandings about Assessment for learning**

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An interpretive, qualitative approach was used to investigate teachers’ understandings about Assessment for learning prior to and at the conclusion of an undergraduate course. Data were gathered through the generation and collection of artefacts, and through focus and individual interviews. Findings indicated shifts in understanding in relation to the purpose and nature of AFL, and the role of the teacher and students. Initially, even though over half of the class had experienced professional development in AFL, understandings could best be described as tentative, restricted and partial; by the end of the course they were, in the main, confident, broad, informed and more complete. Prior to the course, most placed the teacher at the centre and in control of AFL, and struggled to identify specific and active roles for students. Post-course, participants’ responses canvassed a range of tasks or roles that highlighted AFL as a joint enterprise and partnership between teacher and students - students were given a central and active role in their learning. Course members direct experience as learners with the phenomena being studied (AFL), coupled with
readings and discussions, served as catalysts for initiating ‘serious talk’ about the particulars of AfL and the creation of meaningful, deep understandings. Drawing on the notion of apprenticeship within a community of learners, it is argued that teachers need to be scaffolded, coached and guided by more knowledgeable others with attention drawn to the ‘most fruitful aspects of new experiences’ so the ‘right patterns’ embedded within AfL are brought to the fore.

**A sustainable model for experiential learning**

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This paper highlights the role of workplace practicums in teacher education programs and describes a model that has been developed at the University of South Australia, in response to the ‘changing landscape’ (Clandinin, 2008) of both schools and universities. The current context for practicums in teacher education in Australia and elsewhere in the world is extremely challenging. Teacher education itself is facing a plethora of challenges currently with the ‘shifting social landscape’ (Clandinin, 2009) and positioned as it is amidst the changing landscapes of both schools and universities. It will be argued in this paper that a learning communities model of professional experience is an example of responsible teaching and sustainable learning. It achieves this by engaging participants in schools and universities in new ways that emphasise collegiality, authenticity and reciprocity. A theoretical framework is provided in the paper, together with a consideration of the elements that make the model sustainable.

**Group work or collaborative learning? What teacher education students learn from problem-based learn**

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Collaborative learning principles underpin the way problem-based learning (PBL) works, and collaboration within the group work structure of a PBL tutorial is prerequisite for the benefits of PBL as an approach to learning to be sustainable. Aims of this study were (1) to map the attitudes, skills, and knowledge about group work that teacher education students regard as important for teaching and learning, and (2) to gauge the extent to which collaborative learning was a feature of students’ group work experience. Australian teacher education students (n=122) provided written course assignments and journal reflections on PBL for analysis. For Aim (1) students’ attitudes, skills and knowledge were examined in relation to the relevant literature, and classified using the Attitudes, Skills and Knowledge (ASK) framework developed by the authors. For Aim (2) key descriptors of co-regulation and co-construction identified by Summers and Volet (2010) informed analysis of text data using NVivo software. Students identified that Attitudes necessary for collaborative learning were valuing others’ perspectives, interdependence, and learning about self. Skills were characterized as interpersonal, problem solving and group skills. Features of Knowledge were generation, application, and dissemination of knowledge. Pedagogical knowledge was evident through connections made by
students to their prospective teaching roles. Approximately half of the students’ texts referred to statements indicative of co-regulation and co-construction providing strong evidence for having meaningfully engaged in collaborative learning. This research addresses complexities and concerns about group work, and identifies essential attitudes, skills and knowledge needed for sustainable learning with and in groups.

Competences of prospective early childhood teachers at professional schools and universities

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The subjective beliefs of early childhood teachers about the competences inevitable for professional action and about the degree they show these competences themselves are relevant aspects of their professional orientations. In this study, prospective early childhood teachers rated the relevance as well as their own competence regarding several topics of early child education and care. Taking a well-established qualification frame as a starting point, items were constructed which corresponded to the topics of this qualification frame. Participants of the study were a representative sample of 1120 prospective early childhood teachers at professional schools specialized in social pedagogy and students in bachelor-level study courses at universities. The two types of institutions are different professional tracks which both qualify of professional engagement in early childhood settings. At both types of institutions, data of participants attending the first and the sixth semester were collected. Descriptive analyses give insight into perceived relevance and perceived own competence in the topics of the qualification frame. Multilevel analyses show that judgments differ between beginners and graduates as well as between participants of different educational levels (professional schools vs. universities). Interaction effects between time (beginning vs. end of education) and level of institution could also be found. Different interpretations for these findings are discussed and further research questions are deduced from the results of this study.

Longitudinal Effects of a Classroom-Management Intervention on Pre-service Teacher’s Well-being

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Research on teachers’ stress typically identifies student misbehavior as the most important predictor of teacher strain, especially for inexperienced teachers. Despite these findings there is still a lack of options for beginning teachers to learn dealing with these disturbances by enhancing their classroom-management skills. Thus, a classroom-management-skills training for German teacher candidates was developed. In the present study the longitudinal effects (pre/ post/ follow-up) of this classroom-management-skills training for teacher candidates are investigated regarding its effects on indicators of self-perceived classroom-management skills and well-being. Participants (N=97) were assigned to an intervention group which either received a classroom-management-skills training, or a general stress-management training, or to a wait control group which received no training. Results reveal that both trainings are superior to no training regarding classroom-management skills and well-being, but only the classroom-management group seems superior to the no-training group regarding classroom-management skills in the long run. Surprisingly, the classroom-management group also seems to have a tendency to be superior to the stress-management group regarding indicators of well being. Overall the training can be recommended as a useful supplement in German teacher education.

Ways of Knowing: How personal epistemologies mediate the embedding of grammar pedagogy

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This paper investigates the personal epistemologies of teachers in relation to the place of linguistic and literary meta-language in the teaching of writing. The data are a subset of a larger study investigating the impact of contextualised grammar teaching on writing attainment. 31 secondary English teachers in the UK were interviewed once a term over the course of an academic year, following lesson observations. Analysis indicate that teachers’ personal epistemologies relating to meta-language are contradictory; viewing literary meta-language as linked to creative freedom, whereas linguistic meta-language is constructed as associated with rules and restrictions. At the same time, teachers reveal a lack of confidence with subject knowledge in both literary and linguistic meta-language, which may be shaping their epistemological beliefs. The grammar focus of the original study therefore may be being mediated by teachers who subscribe to a literate epistemology which values literary meta-language as part of the knowledge base of a creative, expressive subject which is in line with their beliefs about the value of English within the curriculum. Conversely linguistic meta-language is not included within this literate epistemology and therefore might limit the possible benefits of embedding grammar in the writing classroom.

Pre-service teachers’ epistemic beliefs and the beliefs they assume of their pupils

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Research stresses the importance of addressing teachers’ epistemic beliefs already in early phases of teacher education. Teachers need to be aware of their own assumptions on knowledge and knowledge acquisition plus they need to be aware of their pupils’ attitudes and beliefs. Both aspects may guide their teaching behavior. Against this background, the present study investigates two research questions: (1) Can we identify groups of pre-service teachers that differ with regard to their epistemic beliefs? (2) To which degree do pre-service teachers’ own beliefs differ from the beliefs they assume of their pupils? A sample of 182 pre-service teachers, all students at Oldenburg University, described their own epistemic beliefs by the Epistemic Beliefs Inventory (EBI) before starting a five-week internship in a vocational school. Approximately ten weeks after the first measurement, they were asked to describe the beliefs of a typical pupil they had met in their internship. For the identification of different groups of teachers, Latent Class Analyses were calculated. For each dimension of epistemic beliefs, LCA indicated two subgroups, one with more and one with less sophisticated (evaluatistic) beliefs. This result stresses the heterogeneity of pre-service teachers. It emphasizes that instructors in teacher education need to assess pre-service teachers’ beliefs and to address their beliefs adequately. Only pre-service teachers with more evaluatistic own beliefs differentiated between own and assumed beliefs and presumed less evaluatistic beliefs of their students. They might presume a developmental model in which learners (pupils) gradually acquire more and more evaluatistic beliefs.

Teacher Preference of Practical Knowledge over Theoretical Knowledge in the Era of Standardization

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This paper explores how new teachers perceive the contribution of their formal training to their current professional practice. Specifically we want to examine teacher understanding of theoretical knowledge and practical training as contributors to who they are as professionals. Using semi
structured interviews we asked 60 teachers of maximum 5 years seniority, all graduated from the same teacher training institution in Israel, to talk about the contribution of the teacher training program to their current practice and to who they are as teachers. Our findings suggest that teaching, according to our teachers, is a ‘scripted profession’. Learning to become teachers should center on explicit procedures of teaching and on training in using particular techniques and materials. In such a profession, the intellectual character of teaching disappears as well as differences in knowledge and experience of individual teachers. This has tremendous implications on the future of education in general and on the teaching profession in particular, especially reconfiguring teaching as an occupation that lacks a relevant body of theoretical-philosophical knowledge, striving for oversimplifying the complexity of teacher preparation and normalizing the teaching profession in light of prescribed structures while reducing teachers’ agency.

Personality Similarity Between Teachers and Students as a Bias in Judgment of Student Performance

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Teacher judgment of student achievement is often not only influenced by performance-related student characteristics but also by aspects not directly related with student abilities. There is evidence that sympathy can influence social judgments, so that greater sympathy leads to a more positive judgment. Besides other aspects, similarity between two persons can be seen as one predictor of sympathy. With the present study, we examined personality similarity between teachers and their students and its impact on teacher judgment of student performance in reading comprehension and mathematics. To estimate personality similarity, we conducted intraclass correlations between personality characteristics of 398 dyads of secondary school teachers and their students. This similarity index was brought together with teachers’ global and task-specific judgments of student achievement. Our results reveal that personality similarity has a significant effect on global level judgment in both domains. Students who were similar to their teacher were judged more positively than more dissimilar students, even when students’ performance in the test was controlled. This effect could not be verified for task-specific judgments. Results indicate that impact of potential sympathy bias in social judgments differs between different levels of specificity, that is, global judgments are more likely to be biased than more specific judgments. Theoretical and educational relevance of the findings will be discussed.

Collaboration in a Scientific Community of Practice: Effects of Accessibility of Community Knowledge

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Workshops are a typical method used by scientific communities to facilitate mutual learning on emerging themes. In this context, interaction between workshop participants can be considered as participatory learning. Former studies provided evidence that supporting accessibility of community knowledge can facilitate participatory learning among community members, i.e. leads to a larger extent of collaboration between community members. This study aims to examine the effects of accessibility of community knowledge regarding (RQ1) the extent of participatory learning and (RQ2) the extent of collaboration after participatory learning. In addition, (RQ3) the relation between participatory learning and the extent of collaboration after participatory learning is examined. We compared two conditions implemented in two workshops with overall N = 47 participants. While in one workshop the accessibility of community knowledge was increased through a brochure with relevant information on all participants (high accessibility), the second workshop did not receive any additional information (low accessibility). Results show that high accessibility of community knowledge had the expected positive effect on the extent of collaboration after the workshop. Furthermore, the results show that the extent of interaction during a workshop was only a significant predictor of the extent of collaboration after the workshop if the accessibility of community knowledge was high. A high accessibility of community knowledge seems to allow workshop participants to select their collaboration partners more efficiently. Instead of spending time for the exploration of possible synergies, participants might directly speak to other participants on the basis of the information provided.

**Argumentation in preschool: finding a common ground for collaborative learning**

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Assuming a sociocultural perspective, the paper analyze how argumentation in preschool contributes to create a dialogic social practice aimed to develop children’s socialization through the process of arguing conflicting or alternative points of views. We identify two main tracks of inquiry, respectively devoted to investigate children-teacher talk (CT) and peer talk (PT) in early childhood. CT and PT generally coexist within the same educational setting, but historically they have originated two separated research traditions. Consequently, the relationship between formal and informal talk as a mean for learning in preschool remains relatively unexplored. To fill this gap we chose to analyze the way teachers and children use different kinds of argumentation through CT and PT in kindergarten.
Adopting an ethnographic approach, the study aims to show how CT and PT could integrate and contribute to create a ‘common ground’ for collaborative learning in preschool.

**Predictors of Teacher-child Relationship Trajectories in Australian Primary School Children**

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The importance of positive relationships between students and teachers for school adjustment is well established but few studies have examined trajectories of teacher-child relationships over time. We examined teacher-child relationship trajectories using longitudinal data from 3584 children in the Kindergarten Cohort of the Longitudinal Study of Australian Children (LSAC). Children were aged 4-5 years; 6-7 years; 8-9 years; and 10-11 years. Trajectories for teacher-student closeness and conflict were identified from teacher ratings on the short-form of the Student-Teacher Relationship Scale. Growth mixture models were conducted separately for boys and girls. Multinomial logistic regression analyses were conducted to predict children’s class membership for closeness and conflict. For conflict, five trajectories were identified for boys and four trajectories for girls. For closeness, four trajectories were identified for both boys and girls. For boys, increasing levels of conflict were predicted by conduct problems and poor behavioural regulation; high stable patterns of conflict were predicted by hyperactivity, conduct problems, low scores on the Who Am I?, and poor behavioural regulation. For girls, increasing levels of conflict were predicted by hyperactivity, reactivity and poor behavioural regulation. With respect to closeness, for boys, non-normative closeness trajectories were predicted by lower sociability scores and poor behavioural regulation. For girls, non-normative closeness trajectories were predicted by poorer behavioural regulation. For both boys and girls, the strongest predictor of teacher-child relationship difficulties was low ratings on teacher ratings of behavioural regulation.

**Gordon’s Teacher Effectiveness Training: An intervention study on teachers’ socio-emotional learning**

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Research on how teachers study, develop and improve social interaction is scarce, although these skills are emphasized in modern learning psychology as key tools in a learning community. In this study we explored the teachers’ development of social and emotional learning (SEL) skills by using the Teacher Effectiveness Training (TET) (Gordon Training International) as an intervention with two groups of teachers. We also wanted to approach Gordon’s model from the perspective of modern educational psychology. The effects of TET intervention on teachers were examined by utilizing Kirkpatrick and Kirkpatrick’s model (2006), since we found it important to look at various levels of the outcomes of the intervention, including the participants’ reactions, knowledge, knowledge application (skills) and overall well-being. The teachers participating in TET were class teachers (n=20) from one elementary school and subject-matter teachers (n=23) from one secondary school in Finland. The comparison group comprised subject-matter teachers (n=26) from one secondary school who did not participate in TET. Both the statistical differences of the post-test scores were examined with dependent sample one-way ANOVA. In comparison group, no differences between pre- and post-test measurement were found. Among participants, reactions towards TET were positive. Further, there were significant results at two other levels: both knowledge and knowledge application improved. The overall well-being of the teachers showed minor changes measured at the end of the intervention. To conclude, TET training appeared to reach its goals, since teachers learned to apply the SEL skills during the intervention.

Assisting Learning Disabilities and Empowering Excellence by ‘Clickers’ and Interactive Whiteboards

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Using ‘clickers’ in the class brings the students to become more involved in learning. The anonymity of feedback allows active participation without being exposed to criticism. Thus, ‘clickers’ function as assistive technology, enhancing functional capabilities of students with learning disabilities that are characterized by low achievement, under self-efficacy for learning and performance, lack of motivation, and poor self-esteem. This study examines how learning technologies (Clickers, Interactive Whiteboards - IWB, and learning without technology) in interaction with the academic level of students (from excellence, mainstream, and remedial classrooms) affect their academic achievement, perceived learning, self-efficacy for learning and performance, motivation, and self-esteem. The participants were 74 ninth graders from a large secondary school in Northern Israel implementing Clickers and IWB: from the excellence, mainstream, and remedial classroom, being taught by an experienced language teacher. The experiment included 9 double language lessons - three lessons in each class, with a random distribution of the technological conditions and the counterbalance procedure of the topics learned. The results showed that students in the remedial classroom benefit more from using ‘clickers’, in terms of achievement, perceived learning, self-efficacy for learning and performance, and motivation, probably because of the active participation.
and immediate anonymous feedback. However, the excellence students preferred the cognitive learning approach highly supported by IWB and therefore more pleasurable for this class.

**How do principals and teachers view the implementation of a new ICT strategy in schools in Chile?**

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The discrepancy or similarity of viewpoints between a teacher and their principal is well documented in the literature as a key factor in any type of classroom innovation. The aim of this research is to analyze the similarity of viewpoints between Chilean teachers and principals when implementing a new ICT strategy in third and fourth grade classrooms. The applied methodology was mixed, consisting of a survey and case studies. Teachers were observed to have a more critical viewpoint in general than principals, and specifically relating to the project. We conclude that principal and teacher perspectives regarding the educational potential of new technologies are aligned. However, they hold significantly different views in regard to whether or not conditions conducive to their implementation are present in the classroom.

**New TEL Environments Challenge Vocational Education Teachers to Develop New Instructional Activities**

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The nature of vocational education needs has changed. This creates new challenges for teachers when developing instructional activities. The aim of this study was to explore the different ways in which teachers empower vocational learning in three different new technology-enhanced learning (TEL) settings in Finland and Switzerland. The findings illustrated that in vocational education, different types of instructional activities are needed in various TEL settings. More specifically, results indicated that ‘teacher-led’ approaches were applied in technology-enhanced classroom contexts, ‘teacher-student shared collaboration activities’ were actively used in virtual 3D-game settings, and ‘teacher-student(s)-supervisor(s)’ joint learning activities were used to empower mobile-supported work-based learning. On the basis of the findings raised from these three empirical studies, future prospects for teachers’ activities that facilitate learners’ professional competencies can be developed.

**Stability of teacher expectations: Do views change over time?**

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Within the teacher expectation field, it is assumed that once teachers form expectations, they remain stable. However, this has been rarely examined. Further, there has been no large scale teacher expectation intervention study. The current study examined the stability of teachers’ expectations over a four-month period, and end-of-year student achievement for control and intervention group teachers. Participants were 75 teachers randomly assigned to control and intervention groups and their 1908 students. The intervention involved learning practices of high expectation teachers (those who have high expectations for all students) and implementing them into classes. The control group expectations declined over five months while those of the intervention group increased. Student achievement improved significantly for intervention when compared with control group teachers. The findings have implications in terms of current assumptions about the stability of teacher expectations. The intervention project implies that when taught practices of high expectation teachers, other teachers can change their practices and increase their expectations for all students.

The relationship between university students’ emotions and study pace

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Previous studies indicate that students’ academic emotions are related to approaches to learning and academic achievement. Although the role of emotions in academic learning has been emphasised during the past decade, research on university students’ emotions is still scarce. The present study explored the relationship between students’ study progression and emotions they express related to studying since this relation has not been explored previously. Twenty students from the Faculty of Arts were interviewed about their experiences of their first year of study. Content analysis and comparisons between slow pace and fast pace students revealed that faster pace students expressed clearly more often positive emotions than negative emotions whereas the slow pace students expressed considerably more often and a wider range of negative emotions. Furthermore, the slower pace students expressed a variety of negative feelings that were not mentioned by faster pace students whereas the faster pace students expressed feelings of competence which were not mentioned by the slower pace students at all. The results imply that it is important to pay attention to the emotional aspect of learning because negative emotions might have long-lasting effects on learning processes.

Psychological Capital, Self-regulated Learning and the Mediation of Liminal Space

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The Threshold Concepts approach to student learning and curriculum design (Meyer and Land 2003) entails the notion of students encountering troublesome knowledge in the ‘liminal’ space, a transformative state in which there is a reformulation of the learner’s meaning frame (Schwartzman 2009) and an accompanying shift in the learner’s ontology. To date the notion of liminal space has
remained relatively ill-defined and somewhat of a ‘black box’. This paper argues that students’ capacity or potential to deal with liminality might be mediated by two key psychological factors; the extent to which they are capable of regulating their own learning and the amount of psychological capital they have. Self-regulation of learning (SRL) refers to processes that learners use to systematically focus their thoughts, feelings, and actions, on the attainment of their goals (Zimmerman, 2002). Psychological capital (PsyCap) refers to ‘an individual’s positive psychological state of development’ (Luthans, Avolio, et al., 2007 p3). It is considered a higher order construct that comprises hope, resilience, optimism and efficacy which collectively offer a greater influence on human behaviour than as individual factors. Empirical data is derived from 58 undergraduate level 1 Education students completing the Learning Self-Regulation Questionnaire (SRQL) and a modified version of the Psychological Capital inventory (Luthans et al., 2007). They also write a short discursive essay on the relationship between educational theory and practice, arguably a threshold concept within the study domain of Education. These tasks are evaluated to explore the extent to which students have negotiated liminal space.

**Influence of parental/classroom characteristics on fourth graders’ affective transition expectations**

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Primary school transition is a normative, critical life event which students approach with affectively toned expectations. These expectations can be characterized by their affective valence (positive/negative) and, independently, by their affective intensity (high/low). The theory of critical life events supposes that, besides personal characteristics, positive previous experiences and support from relevant others lead to a more positive anticipation of future situations. Consequently, we assume that, besides fear of social evaluation and general ability self-concept, also perceived parental support and positive school related experiences at primary school influence the valence and the intensity of the expectations concerning secondary school. The assumed relationships were studied by path analyses based on a sample of 881 students. The data used were collected with fourth graders at the end of their last term at primary school. The analyses confirm our assumptions. Parental support as well as school related experiences are important predictors of affective expectations concerning the transition to secondary school. However, not all facets proved to be equally important. In the parental context, emotional support is the strongest predictor of the affective valence and cognitive support proved to be a significant direct predictor of the intensity of affect. In the school context, a cognitively activating instruction is the strongest predictor of the affective intensity. Valence of affective expectations is strongest predicted by pressure to perform. The implications of these results will be discussed with regard to parental and instructional context as a potential to affectively strengthen the students for the transition into secondary school.

**Responsible Teaching in Practice**

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Responsible teaching presupposes teachers inspired from their social responsibility, which, at the stage theories of pro-social reasoning, has been considered as the highest level of the moral reasoning. Responsible individuals justify their engagement in behaviors based on values, and on the desire to improve society, the equality of all people and that they consider the welfare of all members of a society, not only the members of their own community or country. Hence, responsible teaching meets the aims of the SIG ‘Moral and Democratic Education’. An enterprise for responsible teaching pre-requires responsible teachers, teaching methods and design processes that provide school environments that encourage sustainable learning. In this symposium, papers will address issues demanding responsible teaching in the everyday practice. The first paper suggests that perspective-taking, teachers’ ethos and discursive patterns are important preconditions for teachers’ awareness of their responsibility for sustainable learning. The second paper provides evidence for psychological aspects such as global altruism and understanding the interdependence of the societies, awareness of their responsibility and the need to be active as members of their society, as aspects that are positive correlated with their eager to be involved in activities of the sustainable learning. The third paper suggests the Values and Knowledge Education (VaKE) method for creating a learning environment for responsible teaching at the class level. Finally, the fourth paper suggests the participatory design process in designing for curricula and school buildings, combining the expertise of stakeholders to create the best possible possibilities towards sustainable education.

**Food Security: Responsible Teaching and Sustainable Learning in the Context of Teacher Education**

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Within the context of global challenges (e.g., climate change, a fast growing world population), the research we present aims to analyse preconditions for addressing issues of food security within German and Swedish upper secondary teacher education programmes. We claim that teacher education is a promising way forward in meeting these challenges, because teachers are of key significance in educating responsible future generations. But what preconditions ensure that future teachers will be aware of their responsibility to create learning environments fostering sustainable learning? We present a collaborative study of three complementary partner projects targeting specific preconditions and representing different analytical foci: perspective-taking, teachers’ ethos, and thematic patterns in the discourse on food security. The projects share a data base and a jointly developed data collection method. The instrument consists of a slideshow including 80 photos and 3 instructive slides in the respective national language. 760 pre-service teachers and teacher educators from Sweden and Germany were invited by email to watch the slideshow and to write a personal letter to the researchers where they commented upon its content. These letters were analysed as data. Results from all analytical foci indicate that with both pre-service teachers and teacher educators varying degrees of awareness of their responsibility to foster sustainable learning exist,
suggesting that perspective-taking, teachers’ ethos, and discursive patterns are important preconditions for teachers’ awareness of their responsibility for sustainable learning. Implications discussed will address the slideshow as an instrument for data collection and its potential in educational practice within teacher education.

Teachers’ Global Social responsibility as a pre-requirement for sustainable learning

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The claim for sustainable learning and responsible teaching has fundamentally changed what the society should expect from the teachers. Teachers should be fully aware of the complexity and the interdependence of the human life adopting an integrated, holistic, and systemic vision of the learning processes. In this paper, we tested the hypothesis that teachers could not be eager to act within their new role, if they weren’t first, aware of the interdependence of the life at the global level considering themselves as a member of the worldwide interconnected system, and that their responsibility should be extended from their personal level to the responsibility at the social and the universal-global level. Three hundred and thirty three pre- and in-service teachers participated in this study. They introduced to a controversial topic and then were asked to denote their agreement in a number of items measuring the teachers’ willingness to integrate the topic to their teaching. Moreover, they completed the General Belief in a Just World scale, the teacher’s Global Responsibility, with four subscales (Global altruism, Understanding the interdependence, Awareness of responsibility as a member of the society, Active involvement in the society) and the subscale Awareness of Global Communities being bounded together. Results showed teachers are not eager to act within their new role for sustainable learning, if they are not aware of the interdependence of life at the global level and that their responsibility should be extended from their personal level to the responsibility at the social and the universal-global level.

Teacher education for responsible teaching

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The VaKE-method (Values and Knowledge Education) creates a learning environment for responsible teaching. It combines moral education and knowledge building based on the Kohlberg’s theory of moral development and education and on the constructivist learning and development theory in the tradition of Piaget and Glasersfeld. The source of meaningful learning is a moral dilemma. The hypotheses are that preservice teachers who reflect on VaKE-dilemmas with a personal relevant content a) improve the moral argumentation structures expressed in more differentiated moral arguments (concepts) b) build more applicable knowledge expressed in more detailed moral arguments (details), and c) develop more empathic concern than preservice teachers who reflect on VaKE-dilemmas with a less personal relevant content. The hypotheses were tested using a pre-post quasieperimental research design with a control and intervention group and a full replication in an equivalent institution. The results indicate that preservice teachers who reflect upon a personal relevant dilemma increase their sum of concepts and details to a greater extent than the less engaged learners. They also increase their average number of empathic statements to a greater extent than the less engaged learners.

**Participatory design for designing sustainable education for the 21st century**

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Schools have to prepare students for the requirements that are put on the citizens of a continuously changing world. Pupils have to be prepared for the enormous technological possibilities of new media and technology in our digital society and for their uses in participating in decision making in society. Educational environments have been slow to respond to this fundamental challenge. For designing optimal education for students of the 21st century, the involvement of all different stakeholders in a participatory design process is needed. The main aim of this study is to develop a participatory design approach that engages a critical consideration of the democratic process in designing for curricula and school buildings, combining the expertise of stakeholders to create the best possible possibilities towards sustainable education for the 21st century. In an online focus group interview international experts on participatory design of education bring together their ideas about how such a design-collaboration could best be implemented. Additionally, an international stakeholders meeting with architects, teacher trainers, teachers, educational designers, and students answers the question ‘How can the voices of all stakeholders be incorporated in the design of both the curriculum and the building to make the schools as innovative as needed to well prepare students for the 21st century?’. Discussions of both meetings will be qualitatively analysed and results will include experts’ guidelines for how to optimally involve all stakeholders in the (re)design process of innovative instructional methods and school buildings.

**The role of the personal world view of students in the learning process**

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This symposium will aim to enhance understanding of the role played by the personal world view of students in the learning process, with a particular focus on insights gained from religious and spiritual education research. Constructivist learning theories begin with students’ ways of understanding and conceiving how learning issues are to be addressed. Thus, the starting point of learning is constructed as centering on the personal worldview of the learner, a perspective that has become especially important in light of new insights into learning wrought by the neurosciences. Hence, religious and spiritual education has not been a leader in the field of constructivist learning, in terms of research or practice, in the way that an allied field, such as values education, has been a leader. The symposium will seek to address this apparent anomaly as well as point to updated research that is challenging the earlier paradigm. Questions will center on what the long traditions of religious and spiritual education research have to offer to research on learning that takes students’ personal worldviews as the vital starting point in any effective learning exercise. In an era that has seen expanded consciousness of whole person and holistic conceptions of learning, especially through the application of neuroscientific findings, it will be proposed that religious and spiritual education research has much to offer to educational thinking generally. The main focus of this symposium will be on religious and spiritual education in higher education learning.

Personal worldview and goals in theology students’ learning processes

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The aim of this paper is to reflect on the role of personal worldview in the learning processes during university studies of theology and draw together the results of a longitudinal research project among Finnish theology students. The results of various articles and analyses conducted during the project are investigated through a theoretical framework of the role of personal worldview in guiding and controlling action and self-regulated meaningful learning. The various results about the learning and motivational processes among theology students support the theoretical idea that religious questions are intertwined in the personal worldviews and values of students and affect their motivational constructs. This project has shown that students of theology deal with these fundamental questions of spiritual and religious issues in their learning processes before and during their studies, despite the nature of their specific professional orientation. It is suggested here that students in other disciplines in higher education deal also with these questions either explicitly or implicitly. This requires more attention in research in different cultural and learning contexts. The question in higher education context remains, how should we or should we tackle these questions somehow during studying and learning processes.

Towards a pedagogy and worldview of displacement

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Both religious education and spirituality (and education in general) require a critical pedagogy, or what is referred to in this paper as ‘a pedagogical cycle’, a verb-based teaching and learning cycle which is designed to underpin every topic and lecture, every dimension of a course. This in turn impacts upon the worldview which accompanies each of these four dimensions of teaching and learning. This paper contends that both secular and religious transformative pedagogies contain three general, cyclical movements that challenge the student to ‘stretch’ from their comfort zone to their discomfort zone. These movements, articulated most clearly by Brueggemann (1989, 2002, 2005, 2011) are - initial secure orientation (‘business as usual’); through disturbing disorientation or displacement; and onwards towards surprising new reorientation. In examining this pedagogical cycle, the paper incorporates reflective learning log statements from students who have wrestled with these movements during their course work. It also argues that architecture, art theory and artistic practice can assist articulation of this from-through-towards cycle with insights into its own discrete pedagogy and working principles. Hence this paper concludes, based on the Duomo of Milan (Brivio, 2009), the author’s own artistic practice and the relevant literature, that the from-through-towards movement combined with a set of arts-based pedagogical principles (McNiff, 1998; Carroll, 2008) can provide a useful, critically-reflective pedagogical framework for teachers and learners alike. This in turn can make a decisive and long-lasting contribution to both responsible teaching and sustainable learning.

New foundations for theological education in Australian higher education

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The introduction of the discipline of theology to the University of Newcastle (UoN) Australia, a public and secular university, marked a shift in the landscape of theological education in Australia, which had historically been the property of particular religious denominations. With this as its background, our paper will argue that theology’s move from a confessional context to the public square of a secular university carries with it a need to reassess the educational assumptions of theological education. We propose that holistic approaches to pedagogy and curriculum design which attend to student worldview and values provide the necessary theoretical backdrop for theological education at UoN. In contradistinction to theological education which focuses only on religious and spiritual formation of students, our paper will argue that theological education must situate itself as a discipline which is aligned with a particular aspect of worldview, but is also necessarily related to others. As such, it needs to be interdisciplinary and holistic in order to respond to the needs and motivations of the student body to be found in a secular university, as well as to enable students to critically evaluate the theological dimension of their own and others’ worldviews, and to understand the relationship between the theological and alternative worldviews. As has been demonstrated in the context of school-based research, values education can provide the necessary theoretical and pedagogical framework by which to achieve these curricular goals. Finally, we argue that reframing theological education in this way returns the discipline to its home in the University as a ‘discipline among disciplines’.

God images and self definitions among Israeli university students

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The aim of this research is to investigate how Israeli high school students (N=100) who attend secular state schools perceive God and conceptualize his image. Using a novel, typological model (RSTM) and four research tools (three different questionnaires and semi-structure interviews) this research focuses on the way students with diverse religious-secular perceptions conceptualize God and how these understandings reflect the way they define themselves as either religious or secular. The findings of this study reinforce Jung’s theory that perception of God forms one’s personality style (Heising, 1999). The different attitudes that subjects manifest towards God validate their classification into the various types presented in the theoretical (RSTM) typology.

Alternative methods for researching conceptions of teaching and research in Higher Education

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In the field of Higher Education, some attempts have been made to apply metaphors, visualisations, photo-interviews and narratives as a data such as exploring teacher identity, conceptions of research, and professional development as an academic. Metaphors and visual materials are challenging research material to analyse and to deduce meanings based on the complex data. The aim of the symposium is to further understanding and critical approach of analyses of metaphors, visualisations and other non-traditional research data. The four papers provide analyses of various studies in which academics’ conceptions of teaching and research and self-conceptions as a teacher are explored through visualisations, metaphors or role-playing. The following questions are posed: What kind of problems a researcher meets concerning the issues of validity and reliability of the alternative research methods and data? In what ways a researcher can justify his/her research results and conclusions?

Accessing lecturers’ research conceptions through a drawing task

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This study investigates the value of using a drawing assignment to access lecturers’ research conceptions in university colleges. Data were collected by eight focus group interviews with 36 lecturers from four programmes of university colleges in Flanders (Belgium). Lecturers were first asked to think individually about a person who is doing research and subsequently visually represent what the person was doing, after which they got the opportunity to explain their drawings to the other participants. Data were analysed following a grounded theory approach. First analyses revealed the necessity of lecturers’ explanations for interpreting the drawings. Analysis of the drawings together with lecturers’ explanations resulted in three categories of research representations, i.e. research-steps, conditions for doing good research, and perceived importance. Taking the subsequent discussion into account, the categories were refined into four similar but more detailed categories, i.e. research steps, sequencing research steps, characteristics of the researcher and linking research with practice. We conclude that the use of drawings is a good complementary technique for investigating research conceptions. Drawings gave respondents the opportunity to express their beliefs in less confined and more creative ways and provided an excellent entry into a meaningful conversation about research conceptions. As not every participant has drawn and the explanations of the drawings are necessary for analyses, drawings cannot be used as single investigation method but only as starting point for further discussion.

The challenge of using photo-interviews in researching university teachers’ concepts

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Visual research methods have given good results for investigating professional identity and underlying concepts. At the same time, implementing alternative research methods can generate problems for both researchers and respondents. The presentation is based on qualitative research of 15 university teachers who specialize in various scientific fields in higher education. On the basis of the analysis we found that photos provided a tool for both for us as researchers to probe for unconscious thoughts about teaching, but they also helped the interviewees to reflect upon their professional identity and formulate their teaching concepts. The photo-interviewing process was challenging both for researchers and participants, because it’s time and energy consuming and the analysis of the visual images requires visual interpretation competence and has a high risk of subjectivity.

Narrative role-playing as a method for researching university teachers’ self-conceptions

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The main aim of this theoretical presentation with sample cases is to discuss the possibilities of a narrative role-playing method for making visible the influence of internationalisation on university
teachers’ self-conceptions and practice. Teaching and learning in higher education has been influenced by increasing Internationalisation. Internationalisation requires teachers to be skilled managers of a more complex teaching and learning environment. These complex shifts have also been reflected by innovations within research methodologies taking teachers’ perspective into account. The idea of the narrative role-playing method is to investigate the capacity of university teachers regarding their practice and role as actors in an internationalising higher education environment. The findings of sample cases show that narrative role-playing might be a suitable reflective tool for research and pedagogical training settings. However, finding and forming suitable sample episodes for story writing seems to be a critical factor when using narrative role-playing in different circumstances.

**Metaphors as a method for researching conceptions of teaching**

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Conceptions of teaching and learning in higher education have been researched intensively over the last decades. However, some aspects of conceptions of teaching are implicit and therefore difficult to assess. Metaphors can be used as a method for researching these implicit aspects, because they help to make implicit beliefs explicit. This explication of beliefs involves processes of transformation between conceptions and metaphors. Therefore, questions of validity have to be addressed, such as how the generation of metaphor changes the conceptions. Also, the transformation process from metaphors into result by the interpretation through the researcher poses special challenges to the researcher, because they metaphors are highly subjective and context specific. Therefore, special measures to ensure validity and reliability have to be considered

**Mixed Methods in Analyzing Educational Interactions**

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Since the emergence of the Learning Sciences, a broad variety of theories have given precedence to the study of interactions between the social actors involved in educational situations, as the primary vehicle of knowledge co-elaboration. Several decades of research has given rise to a plethora of methods for analyzing educational interactions. There is no single correct, valid or ‘true’ method
here: there are only methods which are more or less theoretically founded, systematically designed and validly applied and useful or fruitful for understanding the phenomena under study. However, educational interactions are arguably of a degree of complexity such that no single method could provide adequate understanding along all levels and dimensions. This symposium is concerned with reflecting on employing mixed methods for studying the interactions between people involved in educational situation. The term mixed methods can be understood in a number of different ways. The most obvious case is where qualitative methods for interaction analysis are combined with quantitative methods. Other combinations of analyses relate to methods that take into account: different timescales, alternative theoretical and analytical visions of a given phenomenon, different levels of analysis pertaining to distinct research fields and first-person versus third-party (e.g. from researchers’ corpus analysis) analytical visions. The use of computer-assisted tools to compare, combine or align multiple methods is an interesting area of study here. This symposium contains of the set of the 4 best papers presented at the EARLI SIG17 conference 2012 and which explored uses of mixed methods for analyzing educational interactions.

Crowdsourcing and participatory media: New ways of working together through online collaborations

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This presentation reports on an empirical study of a company named Get Satisfaction, a company and crowdsourcing community for customer engagement, and their use of a social media technology for enabling online collaboration between end users and professional developers regarding further development of a product. I employ a mixed methods approach; from a quantitative perspective social network analysis (SNA) is used and from a qualitative perspective interaction analysis have been used. At the network level I analyze which discussion threads are the most active with regards to use of emotional qualifiers by calculating a centrality degree. At the interaction level I point out how social media technology as part of a product development process in user-developer interactions are using both textual and emotional qualifiers as regulation mechanisms for getting their voice and tone heard. I have studied user-developer interactions when co-creating a product further. One of the main findings is the need for including more than just text based interaction when investigating new ways of working together through the use of social media. Non-textual information, represented by different emotional qualifiers in social media technology (such as like, good point and mood) adds a new dimension of information that needs to be taken into account when analyzing the data.

Autonomy in teacher-student interaction in the context of individual music lessons

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Paul Van Geert
The need for autonomy is, according to Self-Determination Theory (Ryan & Deci, 2000) an important condition for intrinsic motivation for learning. In music lessons, intrinsic motivation is highly important. Therefore, this study aimed to measure autonomy within teacher-student interactions in music lessons, and connects these real-time changes in autonomy to longer term variables. 38 beginning string students and 8 teachers were repeatedly videotaped during their individual music lessons. The videos were coded on the levels of student’s autonomy expression and teacher’s autonomy support. In a multilevel model, we linked real-time out-of-synch moments (large differences between the teacher’s and student’s autonomy level) to macro-level student outcomes, such as student motivation, overall need for autonomy and lesson progress. We found that real-time out-of-synch significantly predicts student motivation (rated by the teacher) and progress measured after 18 months, but not student overall need for autonomy and motivation rated by the parents. Additional qualitative analyses provided more in-depth understanding of how autonomy was negotiated from moment to moment through teacher, student interactions. This study emphasizes the importance of measuring student autonomy in different ways (qualitative and quantitative) as well as on different timescales (in real time and on the longer term).

Asynchronicity of gestures and talk during children’s peer explanations: competence or difficulty?

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Research on the role of gestures in older child and adolescent learning show that gestures and talk are more coordinated when conceptual content is mastered (e.g. Roth, 2000; Alibali & Goldman, 1993). Is such coordination only indicative of mastering content or is it also indicative of mastering competence in giving explanations in general? We studied the ‘how’ explanations of 6-year old children over two explanation-giving sessions and found that there was a reduction in asynchronous gestures, both in quantity and in the types of contexts in which they occur from week A to week B, when the 6-year olds who participated in our study gave explanations of two different educational games. In addition, the types of contexts in which asynchronous talk and gestures did occur were reduced from three to one. In the second week, asynchronous talk and gestures occurred only in the context where there was a strong syntactic link between the clause with which the gesture was linked semantically and the clause during which the gesture was actually performed. In week B, there were no more asynchronous talk and gestures in explanations during dysfluent speech (hesitations, repetitions, etc.) nor were there during pauses. Students may be more at ease with the experimental situation during the second time, but since the game they explain changes, there cannot be a gain in ‘mastery’ of conceptual content (numbers game vs. spatial game or the reverse). However, there may perhaps be a gain in explanatory competence in the larger pedagogical context.

Levels of analysis in the interpretation of dialogues

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This contribution attempts to engender and to illustrate an alternative approach to the interpretation of dialogues in collaborative learning settings, taking into account the movements across timescales as an additional dimension to the analysis of dialogues. Based on a critical reflection of quantitative content analysis, the argument is made that in order to understand how dialogue may contribute to collaborative learning, researchers need to understand how interactions occurring at different timescales connect. Based on the works of Lemke (2000; 2001), semiotic artefacts are proposed as the carriers of information that enable us to create coherence between distal interactions. Three levels of analysis are proposed and illustrated that focus on respectively: (a) trajectories of the development of interactions over time (macro level), (b) patterns in artefact-mediated interactions (meso level) and (c) the ways in which concepts articulated become materialized in semiotic artefacts (micro level).

The big picture: The here-and-now and wider temporal and social determinations in interactions

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Over the past years, studies in social interactions have given us a deep understanding of the processes by which learning occur in the here-and-now of various formal and informal teaching and learning situations. Careful analyses of the processes by which learners and teachers collaborate, argue, engage in shared activities, disagree, negotiate meaning, guide each other, or construct answers have taught us a great deal about the microgenesis of knowledge. However, many of these processes also appear to be dependent of broader determinations: what happens in the short interval of an interaction between a teacher and a student mostly takes place in the history of a relationship, in the learning trajectory of each of the participants, or at some point in the history of a discipline. Similarly, the meaning of the situation or the values that structure an interaction can only be understood if one considers the classroom setting, the institutional curriculum, or the regional educational policy. This symposium wants to address the difficult and recurrent question of combining analytical scales: how can we combine the short-term event of an interaction with longer time scales? How to articulate the microgenetic processes unfolding as two persons interact, with an understanding of social framings, institutional or national demands? The goal of the symposium is to identify and highlight theoretical frameworks on which we can draw to support such articulation of short and long-term analysis, and local and wider social situations.

Enhanced pre-post test design as tool for studying relationship between micro & ontogenetic change

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The traditional pre-post test experiment design has enabled researchers to study the impact of social interaction on learning and development at the wider ontogenetical scale. However, some researchers rejected the pre-post test design and moved their focus toward a more detailed and qualitative analysis of the process of social interaction in order to understand the dynamics of social interaction and micro-genetic changes happening within. In this paper, a modified, enhanced pre-post test design is going to be presented and analyzed. The modified pre-post test design can enable researchers to studying both micro-genetic and ontogenetic changes and the interrelation between them. The enhanced pre-post test design is characterized by two innovations compared to the traditional pre-post test design. First, it incorporates the Item Response Theory (IRT) as an additional tool providing researchers: (a) to measure in a better way pre-test and post-test competencies, (b) to avoid the artefact of repeated measurement of the same competence in the pre-test and post-test, and (c) a more appropriate selection of items for experimental phase. Second, the enhanced pre-post test design includes a qualitative analysis of selected cases based on the pattern of their pre and post test results. For example, through a comparative qualitative analysis of cases with and without progress between pre and post-test phase we can learn more about the way how ontogenetic changes are fabricated out of complex dynamic of micro-genetic changes emerging within the social interaction.

Analyzing transitions from school to work through situated trajectories of participation

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In Switzerland, vocational education and training is the pathway most followed by young people after compulsory education. The majority engages in the dual VET system combining periods of learning and work in three different environments: public vocational schools, companies and inter-company training centres. Our contribution investigates how the dual training system supports the process of transition from school to work and prepares young people not only to a specific occupation but also to the workplace. The questions we address are the following: How are apprentices socialized in the different institutions in which their training takes place? How do they participate in social practices typical of these institutions? How do these forms of participation evolve in time and enact mechanisms of transition? What do these forms of participation and their dynamic transformation mean in terms of learning and socialization? To address these issues, we analyze training situations and refer to a set of audio-video data documenting the activities of different apprentices in the three contexts composing the Swiss dual VET system. Our analysis focuses on the verbal and non-verbal interactions apprentices engage in with different sorts of experts. At a methodological level, we combine a microanalysis of interactional episodes with larger-scale units, defined as ‘situated trajectories of participation’. In our contribution, we will define such units and illustrate with two case studies their analytical potentialities for investigating the challenges met by apprentices in their journey into professional life.

Developmental potentials in dialogical action research – dealing with ambivalence

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The action research presented was commissioned to investigate alternatives to the New Public Management which largely governs public services in Denmark. The present system is diagnosed as: hyper-complex and unmanageable, paradoxical and contradictory (for instance expecting higher quality for less money) and contaminated with ‘wicked problems’ (problems that won’t go away, only move). The specific field of collaboration was the day-care sector. The overall agenda of the research was to create conversational spaces and time in which a move from a mode of monologue within the managerial system to a mode of dialogue could develop. This space should welcome multivoicedness, multiple goals, interest, visions, tension, problems and concerns but also to make spaces for voices to be heard and to support less loud voices. The multivoicedness was rather than the ‘problem’, considered being the potential for productive changes. Kindergarten children, pedagogues, leaders of institutions, parents, administrative consultants, head of administrative departments and local politicians participated in ‘developmental laboratories’ throughout the year the practical collaboration lasted. Dialogues about issues of shared importance disturbed and enriched understandings, practices and positions on all levels.  The paper will present what is considered to be one salient aspect in the developmental processes.  Ambivalence and the outcomes of ambivalence seem to be a salient place to study, whether the issue is to ‘maintain and/or create new understandings and meanings’, ‘maintain and/or develop new practices’ or ‘remain and/or develop new aspects of professional identity’.

Apprehending cultural dynamic within social interactions

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One of the projects of current sociocultural theories is to allow us to examine how humans are always already cultural, and how by their participation in a world of culture, people become themselves and transform their environment (e.g, Valsiner, 2007). When it comes to education, it raises the question of how to examine these mutual negotiations, as everything, from the school curriculum to the material classroom, the modalities of interaction and the social representation, is in this sense ‘cultural’. One option has long been to apply complex layered or systemic models to such situations and see mutual relationship of dependencies. Here, we propose a different approach. Drawing on a broadly speaking dialogical framework and a recent large scale research project, we will identify diverse units of analysis by which we observe, within educational situation, how the social and cultural world as well as its boundaries can be experienced as constraints, but also as opportunities for change and creative development.

Representing and solving arithmetic word problems: The role of (meta)cognitive factors

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Over the past decades, many studies were set up aimed at constructing and testing theoretical models about the processes taking place when learners try to understand, represent, and solve word
problems as well as about the components (i.e., problem schemes, action schemes, heuristics, metacognitive strategies) that are involved in those processes. Nevertheless, several important questions and challenges remain, especially relating to the initial phases of the problem-solving process wherein the solver tries to build an appropriate and functional representation of the problem. The papers in this symposium represent various attempts to deepen our insight into the impact of various kinds of task and subject factors on the problem representations students construct and how these representations affect their final solutions. The methodologies range from the use of eye movement data collected in strictly controlled laboratory settings to analyses of students’ protocol data collected in individual interviews. Overall, the studies yield strong support for the variety and complexity of these representational processes, and their crucial role in the overall solution process. They also demonstrate the complex and subtle interaction between these internal representations and external representations being provided to or created by the solvers. Finally, they also reveal the significant role of specific task variables that have received little or no research attention so far, such as the format in which the numbers are presented and the precise nature of the accompanying drawings, as well as of subject variables, such as students’ memory updating capacities and their metarepresentational knowledge.

Depictions as a last resort? Students’ representations of non-algorithmic mathematical problems

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Enabling students to creative thinking and problem solving is a broadly accepted aim of math teaching. However, students often have difficulties when dealing with non-algorithmic problems that require creating adequate non-standard representations. Flexibility in creating and using such representations seems to be a key issue for solving word problems. The following study aimed (a) at analyzing which kinds of representations are created spontaneously by students from different grades when solving non-algorithmic mathematical word problems and (b) how these representations are related to success or failure in problem solving. Descriptions (e.g., mathematical equations) and depictions (e.g., sketches or diagrams) were distinguished as two categories of representations. 270 primary and secondary school students were asked to solve five non-algorithmic problems individually. They could use different work material, but did not receive any detailed guidance. Students’ solution processes were video-taped and coded by independent raters. Data analysis revealed that most students had difficulties in solving word problems. Although students at higher grades solved more problems correctly (r=.60, pSD=1.04) out of five possible correct solutions. Students created predominantly descriptive representations (M=4.07, SD=.47), whereas depictive representations were constructed much less frequently (M=1.61, SD=1.07). Moreover, the combination of depictions and descriptions seems to decrease the likelihood of complete failure in problem solving after taking grade level into account (r=.13, p=.04). To conclude, solving non-algorithmic problems remains a challenge for students at all grades. Skillful combinations of adequate representations seem to be a promising approach for instructional practice.

Do students use external representations to solve mathematical word problems?
When elementary school pupils solve a mathematical word problem, they tend to solve it purely mathematically, without considering their everyday knowledge of the real world situation described in the problem (Verschaffel, Greer, & De Corte, 2000). In order to encourage pupils to think more realistically about these problems, Dewolf, Van Dooren, EV Cimen, and Verschaffel (2012), set up a study in which pupils received a set of word problems that are problematic from a realistic point of view (i.e., P-items from the research of Verschaffel, De Corte and Lasure, 1994), together with representational illustrations that represent the problematic situation described in the problems. It was expected that the illustrations would help pupils to mentally imagine the problem situation and so solve the items realistically, but no effect of the illustrations was found. Afterwards, we conducted two follow-up studies to investigate if and to what extent people attend to these illustrations. In the first study, we measured higher education students’ eye movements to investigate whether they paid attention to the illustrations that accompanied the P-items. The findings of this study showed that, as elementary school children (Dewolf et al., 2012), higher education students neglect their everyday knowledge when solving P-items, but also that they barely look at the illustrations. In the second study, we manipulated the presence of the illustrations so students could not but look at them, but, again, these were ineffective. The theoretical and educational implications of this set of related studies will be discussed.

Memory updating ability and external representations in relation to arithmetic word problem solving

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In the present study, we analyzed to what extent children with different level of memory updating ability are able to detect inconsistencies during arithmetic word problem solving and whether this cognitively demanding process influences the solving task. In addition, problems were presented
with/without illustrations depicting the information to be updated. Two groups of sixth graders with high and low memory updating ability solved arithmetic word problems with/without inconsistencies. Problems were presented on a computer screen one line at a time. Participants controlled the presentation of the problem with a line advance key. Thus reading times (related to the inconsistency) and response times to the solving task were controlled. Results showed that only children with high memory updating ability were able to detect inconsistencies (they devoted longer reading times). Furthermore, this group of high memory updating ability spent more time to solve the problems with inconsistencies. Data also showed that participants were more error prone when the problems required detecting inconsistencies. Since detecting inconsistencies requires metacognitive strategies, the results can be interpreted as supporting the importance of these strategies in word problem solving.

The role of number representation modality in solving word problems: An eye-tracking study

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This study aimed at investigating 4th grade students’ eye-movements during arithmetic word problem solving in order to reveal connections between achievement, number representation modality, and various measures yielded from eye-tracking. The sample consisted of 24 students (13 boys and 11 girls, mean age 10 years and 5 months). The students solved a 2x2 system of four tasks: addition, numerals; subtraction, number words; subtraction, numerals; addition, number words. All tasks contained an inconsistent keyword (e.g., shorter, when addition was required). Five dependent variables have been computed for each task: (1) achievement, (2) response time (RT), (3) fixation duration on the text (FDT) and (4) on the number areas (FDN), (5) fixation duration on keywords (FDK). There were no significant correlations between achievement and FDN nor between achievement and FDK. However, significant correlations were found between FDN and FDK, both for Task 1 and Task 3, but not for Task 2 and Task 4, suggesting that the number format played a significant role in the problem solving process. The significantly higher RTs in case of the word number format tasks were due to the higher FDN. The operation to be computed in the task played a significant role in FDT (higher values for subtraction). Since most of the task booklets use numerals as the modality of external number representation in word problems, our research may yield new results about the practical use of this type of tasks.

Scaffolding Interactive Learning

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In educational research a variety of scaffolding approaches have been developed in order to support learning with technology. Such techniques vary between computers as a mere tool up to computer-based learning environments with integrated scaffolds. The latter is the genuine theme of this symposium that gathers different approaches of scaffolding of interactive learning and analyses their constraints, predictors and effectiveness. The contribution by Bannert et al addresses here the level of metacognition. They analyzed the influence of self-created metacognitive prompts during hypermedia learning. Results reveal that compliance to use these prompts and learning performance is higher when they are created by the learners themselves. The advantage of metacognitive prompting is also shown in the contribution by Feyzi-Behnagh et al using such a scaffolding technique during learning with an intelligent tutoring system. Results show that adaptive scaffolding can improve student’s learning. Vandewaetere et al examine the influence of type of advice in scaffolding support. They compare learners with no advice, advice prior to use and pre- and in-task advice on tool selection during learning. Findings show variables like advice, motivation, prior tool conceptions, and self-regulated learning influencing perceived functionality of the scaffolds but not or only slightly affecting learning performance. Zumbach and Moser analyze cognitive support in non-linear auditory learning environments. They show that the more activity a scaffold requires, the more learners can benefit, but a slight change in learning design might reverse this effect. All contributions will be discussed in respect to how scaffold interactive learning adequately.

**Promoting Learning through Student’s Self-Created Metacognitive Prompts**

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The aim of our research is to support metacognitive skills during learning by means of metacognitive prompts. In this study we analysed the effects of a new kind of metacognitive support on learning processes and on learning outcomes of university students. In a pre-post between subject design students of the experimental group (n = 30) were individually instructed to create their own prompts and had to learn with them afterwards. Students of the control group (n = 30) learned without prompts. Think-aloud data was collected during the experiment in order to investigate the quality of the learning process of both groups. Compared to previous studies results show an enhancement of the compliance of the learners using these self-created metacognitive prompts. Moreover, the enhanced use of the provided support also increase learning and transfer performance.

**Aligning Multiple Sources of SRL Data in MetaTutor: Interactive Scaffolding in Multi-Agent Systems**

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100 undergraduate participants were randomly assigned to one of two experimental conditions (Prompt and Feedback [PF] and Control), and used MetaTutor (a multi-agent hypermedia intelligent tutoring system [ITS]) to learn about a challenging science topic (i.e., the human circulatory system) for two hours. During the session, we collected product (e.g., pretest, posttest, quizzes, summaries), and process (e.g., concurrent think-alouds, eye-tracking, log-files, face videos, physiological data, screen recordings, metacognitive judgments, and notes and drawings) data to analyze the roles of cognitive and metacognitive processes during learning about the topic with the system. Aligning trace data from eye-tracking and system-generated log-files, we investigated the occurrence of the SRL strategy coordination of informational sources (COIS), text and diagram inspection time, as well as the occurrence and accuracy of metacognitive judgments (JOLs, FOKs, and CEs). Results indicate that learners in the PF condition performed significantly higher number of COIS compared to those in the control group, and had significantly more accurate metacognitive judgments. We will illustrate and describe how these data, methodology, and findings can be used in augmenting current models of SRL, and ultimately in the design of ITSs which can provide adaptive scaffolding for interacting learning of challenging science topics, such as the human circulatory system.

The role of advice in students’ perceived functionality of support tools

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Computer-based learning environments can provide students with additional tools that support their learning process (e.g., dictionary, graphs). However, research has demonstrated that students’ tool selection and tool-use is often suboptimal and largely affects learning outcomes. This may be related to students’ self-regulated learning skills, an important behavioural component in learner-controlled learning environments. Due to a lack of self-regulation skills, learners may not correctly perceive the functionalities of available tools, which can explain their maladaptive tool-use. Also, students’ prior conceptions about the functionality of particular tools may largely affect the selection of tools. This study focuses on the effect of providing advice on tool selection and its interaction with students’ self-regulation skills and prior tool conceptions as a way to enhance students’ perceived functionality of support tools and hence to promote students’ tool selection. Moreover, we expect that advice that is more frequently presented (before and during task completion) may strengthen the effect of
advice on students’ tool perceptions and tool-use. In this study, students were assigned to one of three conditions: (1) no advice on tool selection, (2) pre-task advice on tool selection and (3) pre- and in-task advice on tool selection. Results indicate that advice as such, students’ prior motivation, prior tool conceptions and self-regulated learning skills are related to perceived functionality of tools, but that these predictors do not or only slightly affect students’ tool-use and learning outcomes.

Supporting knowledge acquisition in Hyperaudio learning environments

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In two studies we examined the question how learners within portable, non-linear auditory learning environments (Hyperaudio) can be supported. Based on prior studies on Hyperaudio revealing problems related to learning efficiency, we analyzed here the influence of two supporting mechanisms. In a first experiment (n=80), the influence of short summaries on learning performance was manipulated. In addition, the influence of linear compared to non-linear sequencing of auditory was tested here. Results of this experiment revealed no significant differences between learners that were supported by short auditory summaries preceding each audio file and those without that support regarding learning performance. Also no differences between linear audio and Hyperaudio were found here. In a second experiment we also compared linear vs. non-linear auditory information retrieval (n=120). In addition, we provided in one condition short problem-solving tasks that had to be solved with the information from each single audio file. Results suggest that Hyperaudio leads here to worse learning performance compared to linear information retrieval. Additional problem solving-tasks related to the learning material showed significantly increased learning performance. There was also an interaction effect found. Results suggest here, that Hyperaudio leads in one case to comparable learning performance and in one case not. Nevertheless, is seems to be advantageous to foster deeper processing by supporting learners with additional problem-solving tasks. Providing short summaries does learners not automatically lead to deeper information processing and, thus, does not prove to enhance effectiveness here.

Summative assessment that supports student learning

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The main function of formative assessment is to support and regulate activities of student learning, whereas the principal aim of summative assessment is to ascertain whether students have attained learning goals at the end of a period of instruction. It is increasingly recognized, however, that - in a broad perspective of ‘assessment for learning’ (AfL) - the way in which summative assessment is
designed and conducted can have a major impact as a means of supporting students’ progression toward valued learning goals. The papers in this symposium will examine several ways in which summative assessment can make a positive contribution to student learning, as well as the factors that can limit or distort this impact. The contributions considered include: (1) the role of task design in creating summative assessment instruments that encourage student investment in learning; (2) the relationships teachers establish between summative and formative aspects of assessment when grading of student work; (3) teachers’ collaboration with colleagues as a way of increasing the coherence of summative assessment in support of student learning; and (4) teachers’ use of standards, professional judgement and social moderation at system and local levels for improved classroom learning and system accountability. The papers have implications for the conceptualisation of the relations between formative and summative assessment and for the development of assessment policy and practice.

Summative assessment for learning: How it may impact task design

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The relationship between summative assessment (SA) and formative assessment (FA) has been little explored. Part of the issue of the SA-FA relationship depends on the extent to which SA and FA are treated as separate processes. The purpose of this paper is to examine the factors that limit the contribution of SA to support learning and how they impact on task design. It will do so by looking at different levels of domain specification and precision which will be referred as ‘fine-grained’ and ‘large-grained’ assessment, both being the result of the elaborateness and of the length of the cycle of assessment. Whether fine-grained or large-grained, assessment task design should consider the distal or proximal nature of instructional goals. SA and similar large-grained assessments have been unfortunately constrained to retrospective information which has resulted in domain impoverishment and prevented using SA prospectively in setting appropriate distal learning goals. Restricting SA to retrospective information and limiting FA to proximal goals and fine-grained assessment may have limited teachers’ capacity to be flexible and creative in the development of a variety of assessment tasks. A better integration of SA and FA may contribute to the development of an enlarged theory of classroom assessment that would take into account domain precision, feedback category, and goal proximity in order to improve the design of assessment tasks in the support of learning.

Assessment judgment in practice: Teachers’ thinking aloud during the grading process

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The research examines teachers’ professional judgment in summative assessments which concern 8 to 9-year-old students, in mathematics (when solving additive problems) and in French (when writing an argumentative text). Our hypothesis is that formative reasoning during the process of judgment is a possible resource for teachers when they have to face dilemmas in the summative assessment of student learning. In order to study the interpretation and reasoning processes of teachers, we used a ‘think-aloud method’ in which teachers talk through their thinking and decision-making processes while grading samples of student work. Our findings highlight different ‘figures of assessment
judgment’ in relation with three categories of assessment dilemmas: technical, interpretative, ethical. In one particular figure of assessment judgment, formative interpretations appear to underpin summative assessment: teachers aspire to test the validity of an interpretation they initially formulated, for instance by consulting other examples of the student’s work or by imagining a future situation/task/exercise in which the student could be observed. Implications are discussed for improving the quality of summative assessment practices in the classroom.

**Teacher collaboration: Promoting coherent summative assessment in support of student learning**

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This paper approaches teacher collaboration in summative assessment from a situated perspective emphasizing the role of ‘joint enterprise’ in a community of practice and on the basis of research on teachers’ engagement in ‘joint work’. An analytical framework is proposed for studying four facets of teacher collaboration in summative assessment: the dynamics, the scale, the object(s), and the aim(s) of collaboration. This framework is used to present findings from interviews with sixth-grade teachers and to compare these findings to those of other research. Implications are discussed with respect to the conceptualisation of teacher collaboration and with respect to policies that can enhance the coherence of formative and summative assessment in support of student learning.

**Moderation and standards using a dialogic approach: Exploring the centrality of teacher judgement**

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Central to the proposal for a critical dialogic approach to assessment is the understanding that teacher judgment is nested within a range of decision making relating to curriculum frameworks, assessment practices, the school-community interface and individual student learning needs and goals. By extension, this approach positions the teacher and students as active agents in purposefully gathering information about and reflecting on learning and performance over time. The proposition explored in this paper is that it is in the context of standards-referenced moderation that teachers can subject their own judgment practices to scrutiny, with direct benefit to teaching and learning, as well as the defensibility of judgments.

**University Teachers’ and Mentors’ Motivation and Emotion**

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Teacher motivation and emotion has become a significant area of research in teaching and teacher education, including studies of the many factors that influence a person’s motivation to pursue a career in teaching, more specifically to enter, leave or stay the profession. To date, most of the empirical work has focused on schoolteachers, leaving university teachers somewhat disregarded. The four papers presented in this symposium will address this neglected field of inquiry from different perspectives and different contexts. Data was collected in four different countries and using a broad range of methodological approaches. Collectively, the four papers provide support for the theoretical and educational significance of studying motivation and emotion of university teachers. The first paper investigates early career university teachers’ motivation, with a focus on their personal career goals, goals for teaching, achievement goals and sense of self-efficacy. The second paper investigates university mentors’ emotions. Positive and negative emotions arising from the mentoring process are documented and discussed. The third study explores the range of university teachers’ emotions and the elements in the teaching process that trigger those emotions. Finally, the last paper reports a small-scale longitudinal study of university teachers’ emotions and emotion expression while teaching. Qualitative analyses revealed a range of positive and negative emotions triggered in specific teaching-learning situations, leading to the identification of three major themes related to the emergence of these emotions.

**Goals of Early Career University Teachers**

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Teacher motivation and specifically teachers’ goal orientations have become a significant area of research in teaching and teacher education. While most of the studies focus on schoolteachers, teachers in higher education have been left somewhat disregarded. Yet, this area is a particularly interesting field of research since teachers in higher education typically do not pursue a career in teaching but find teaching to be a part of their profession as academics. Especially young academics, who can be assumed to primarily pursue academic qualification and try to integrate into the scientific community, were found in prior research to perceive this work context and balancing their different roles highly challenging. Thus, this study investigates early career university teachers’ (ECUTs') motivation, focusing specifically on their personal career goals, goals for teaching, achievement goals and sense of self-efficacy. The results show that most participants emphasise goals related to their research and qualification rather than teaching. Focusing on their goals as a teacher, four areas of teaching goals emerge: student-directed, self-directed, teaching-directed and content-directed teaching goals. Based on these, three different types of teachers were identified.

‘I enjoyed helping people..’: The emotions of university peer mentors

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There are few studies that have investigated mentors’ emotions in higher education, despite the growing body of research on emotions in academic settings. This exploratory study examines the emotions of peer mentors involved in a university-wide peer mentoring program for new students. Participants were 74 mentors over one semester, who responded to online open-ended survey questions regarding their experiences. Analysis of 20 negative and 60 positive text segments revealed that although most were frustrated by the lack of responses from mentees, they found the experience a positive one. Unlike other studies, the lack of response did not daunt the mentors. Positive emotions, however, were bland compared with other studies and this may have been due to the retrospective nature of the data. Nevertheless, the study indicates a range of positive and negative mentor emotions and supports the need for further research in this area of emotions in higher education.

*What triggers emotions in university teaching?*

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The present study explores the range of university teachers’ emotions and the elements in the teaching process that trigger those emotions. A total of 17 teachers representing four disciplines were interviewed before and after teaching a specific course. The interview questions did not directly address the role of emotions, but a range of spontaneously expressed emotions was identified through content analysis. Teachers’ emotions ranged from positive to negative, as identified in some previous studies as well. The elements triggering the emotions were identified, which showed that positive and negative emotions were triggered by partly diverse elements in the teaching process. These elements could be grouped under five categories: 1) course design 2) own teaching 3) students’ role and activity, 4) interaction between teachers and students and 5) assessment of learning outcomes. Positive emotions were mostly triggered by course design and interaction, while negative emotions were mostly caused by assessment of student learning. Emotions concerning own actions were expressed more seldom than emotions concerning students’ role and activity. The results revealed that identifying which elements trigger teachers’ emotions is important in expanding awareness of the role of emotions in academic teaching.

*University teachers’ emotions and emotion expression: a neglected field of higher education research*

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This presentation addresses the issue of university teachers’ emotions generated through teaching and the perceived ‘appropriateness’ and functions of various forms of teacher emotion expression. In light of the increasing focus on the quality of university teaching around the world, and evidence of the impact of emotions on teachers’ wellbeing and teaching practice, a better understanding of the
origin and nature of emotions experienced by university teachers is needed. This presentation reports the findings of a small-scale longitudinal study with 15 teachers from two public Australian universities. Two in-depth interviews with each teacher generated rich accounts and reflections on their emotional experiences and emotion expression during teaching. The qualitative analysis revealed a range of positive and negative emotions triggered in specific teaching-learning situations. Three major themes related to the emergence of emotions were identified: the importance of the intrinsic value and social nature of the teaching profession; the degree to which expectations of students’ engagement were fulfilled or not; and the realization that the teaching practice is only partly controllable. Teachers viewed the open expression of positive emotions as an integral part of teaching. In regard to negative emotions, they stressed the need to control and occasionally conceal these experiences. The findings are discussed in the context of previous research, the limitations addressed, and directions for future research proposed.

**Reasoning in young children: Development and supporting instructional factors**

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An understanding of the hypothesis-evidence relation may be considered a core element of children’s scientific reasoning. Accordingly, different aspects such as generating hypotheses, designing experiments, interpreting data, evaluating evidence, and understanding the nature of science are typically investigated. Although recent findings demonstrated basic competencies already in elementary and preschool-aged children, to date we have no clear picture of the involved developmental factors or individual and contextual aspects supporting this development. As scientific reasoning is presumed to promote conceptual understanding in core domains of science, and vice versa, a deeper investigation of the involved factors is of high importance for instructional design, even in early science education. In this symposium, two papers will shed light on the developmental aspects of scientific reasoning in cross-sectional studies, focusing on children’s understanding of science methodologies and the nature of science (paper 1) and on young children’s abilities to use evidence in a science content domain (paper 2). Research on supporting factors of scientific reasoning showed that direct instruction with explicit feedback and explanations proved to be successful with regard to science methods. However, problems arose in transfer tasks. Papers 3 and 4 tackle this problem and suggest different ways of supporting scientific reasoning by widening the view from direct instruction. One paper discusses concrete versus abstract examples as aids to understand experimental design, while the last paper focuses on informal reasoning processes and claims that student-constructed visual representations during problem-solving in science offer opportunities for reasoning in different ways.

**Elementary school children’s competencies in scientific reasoning**

1040
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In the lastyears basic abilities in scientific reasoning have gained much attention from developmental psychology as well as from science education and educational psychology. Despite a general recognition about the importance of gaining a better understanding about the early development of scientific reasoning, a coherent picture of what actually constitutes scientific reasoning as well as of its underlying developmental processes and supporting factors does not exist as of yet. In this study, we investigated 2nd, 3rd, and 4th graders’ scientific reasoning competencies concerning various aspects. In a rotated design we presented N=1728 children with 57 tasks and tested their understanding regarding the nature of science and their understanding of scientific methods. We found that scientific reasoning competencies of elementary school children can be scaled with the best fit of a one-dimensional model. This demonstrates that even in this early age, scientific reasoning can be conceived of as unitary construct, related but separate from other cognitive factors such as intelligence. Furthermore, we identified a significant development of performance between 2nd, 3rd and 4th grade with significant differences between all three grades. More detailed analyses revealed that children on the individual level held fairly consistent conceptions about science. While 2nd graders showed consistency on naïve and advanced levels of scientific reasoning, this consistency reshaped from grade 2 to 4 in favor of more advanced conceptions. We discuss our results with respect to the structure of scientific reasoning in elementary school and the influence of different factors for its development.

The effect of example concreteness on sixth-grade students’ learning of experimental design

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A primary goal of education is to enable students to transfer what they learned well beyond the specific context in which it was acquired. One factor that has been found related to transfer is the extent to which illustrative figures used in the initial instructional context are abstract or concrete. Previous studies have found better immediate learning when concrete rather than abstract figures are used during training. However, the relative effectiveness of concrete over abstract training materials reverses on transfer tests, where initial training with abstract figures produces better transfer than training with concrete materials (e.g., Goldstone & Son). In this study, we investigated the concrete-abstract question on US sixth-grade students’ learning of experimental design. Based on earlier findings that some students adopted an ‘engineering stance’ in which their goal was to generate specific outcomes, rather than focusing on the abstract properties of unconfounded experiments, we hypothesized that providing abstract versions of experiments without real variables during instruction would improve student learning over only providing concrete examples. We used three different training conditions: (a) Concrete-only in which all experiments were concrete, (b) Concrete-fading, in which the first experiment was concrete the second intermediate, and the final one abstract, and (c) Abstract-fading, in which the first experiment was abstract, the second intermediate, and the final one concrete. Counter to our hypothesis, students who initially evidenced an engineering orientation benefited most from the Concrete-only condition.

Quality learning and reasoning through representation construction in school science

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There has been strong research interest in reasoning in science, across a number of disciplinary and theoretical traditions. This research has mostly focused on formal, syllogistic, verbal processes involving formal logics of inductive and deductive thinking. Recent interest in argumentation as a pedagogy representing the core process of coordination of ideas and evidence follows this tradition. In this paper we will draw on data from the ‘Role of representation in learning science’ project, involving the video capture of classroom sequences focused on representation construction, to argue that a) informal reasoning processes should be central to school science purposes and practices as they are to knowledge generation in science itself, b) representational challenges open up opportunities for reasoning in a number of ways, c) informal reasoning through representation construction involves distributed claims and backing of a different nature to those represented in formal syllogistic accounts of reasoning, and d) argumentation is best seen as an emergent practice within informal model based reasoning processes focused on authentic problems.

Development of students’ competencies in reasoning with evidence from preschool to elementary school

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Learners’ coordination of their (naïve) theories with corresponding evidence has been repeatedly stated as a core goal of science education. An appropriate use of evidence refers to a person’s judgment of whether a presented piece of evidence is confirming, disconfirming or irrelevant to a given hypothesis, thus involving deductive reasoning. According to the conflict strategy, evidence disconfirming one’s prior belief should be related to conceptual change as new explanations need to be generated. However, young children’s ability to reason with evidence in specific science content domains has rarely been examined. In the present study, we focus on young children’s capability to reason with evidence in the context of elasticity. We presume that children’s use of evidence shows developmental patterns found with content-lean tasks of deductive reasoning and that it shows systematic relations to three measures: domain-general scientific reasoning, working memory, and prior content knowledge. In a cross-sectional study of four groups of children in preschool and elementary school age (total N = 142), we administered a test of reasoning with evidence as well as the three above mentioned measures. As hypothesized, analyses showed a highly significant effect of age with regard to the frequency of six patterns of deductive reasoning. Similarly, children’s ability to coordinate and use evidence increased significantly with age. Analyses with GLMM models of the contribution of domain-general scientific reasoning to performance on the domain-specific reasoning tasks showed a significant contribution of domain-general differentiation between theory and evidence, even after controlling for working memory and inhibition.

**Theoretical Challenges for Motivational Regulation: Action-Related Considerations Revisited**

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Motivational regulation is applied in very diverse research contexts and in very diverse theoretical frameworks. Often, the theoretical implications correspond very closely with the empirical setting. A change in the empirical setting might often cause the theoretical expected outcomes to vanish. If we don’t want to have theoretical explanation for each empirical setting, broader theoretical
foundations have to be identified. The four proposed theoretical approaches proposed in this symposium are all quite complex and try to combine motivational regulation and action-related theories. The overarching character of these proposals leads to quite complex theories. Therefore, it might be difficult to test all given assumptions empirically, at least not simultaneously. The contributions in this symposium explore different ways of incorporating action-related ideas. The first contribution proposes a theory of perceived control of the attribution process. The second contribution follows an idea by Andreas Krapp to claim conceptual independence between intrinsic and extrinsic motives and link these motives to different valences that determine the readiness for action. The third contribution builds on consideration from action theory, often applied in workplace psychology. The two main dimensions are action phases and the distinction between of conscious and unconsciousness processes. The fourth contribution is based on the ideas of Julius Kuhl who proposes 4 macro systems for action-related processes and specifies motivational regulation in three main phases of action generation. All four contributions strive after integration of emotion and cognition as well as unconscious and conscious processes. The comparison of the four solutions for this integration problem should lead to a common understanding of future theoretical development.

**Toward a Theory of Perceived Control of the Attribution Process**

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Recent discussion on secondary control (SC) has demonstrated inconsistencies in the interpretation of the construct which make it difficult to draw conclusions about its influence on behavior. Other constructs have emerged that focus on perceived control of internal states, yet similar issues remain. The purpose of the present work is to identify a stable individual difference in perceived control of the attribution process. Specifically, perceived control of attributions (PCA) is defined as the perceived capability to influence attributions and awareness of the motivational consequences of such attributions. It is proposed that PCA will be predictive of the same outcomes that perceived control has been shown to predict such as psychological well-being, persistence, and effort (Deci & Ryan, 2000; Patrick, Skinner & Connell, 1993; Stipek & Weisz, 1981). The work on secondary control (SC) and perceived control of internal states has made a considerable contribution to the motivation and coping literature, yet it is proposed that PCA captures a more accurate representation of perceived control of internal phenomena and is separate from the construct of secondary control.

**Towards a unified theory of task-specific motivation**

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Extrinsic and intrinsic types of motives appear in every conceptualization of task-related motivation. Some theories view intrinsic and extrinsic motives as different aspects of the umbrella concept of expected value. Other perspectives conceive extrinsic and intrinsic motives as oppositional motives on one and the same dimension. A review of several
theories representing these different positions reveals that both have their merits. This controversy can be resolved using a third perspective, proposed by Andreas Krapp, that claims conceptual independence between intrinsic and extrinsic motives. According to this view affective valences (intrinsic motivation) are produced by an affective regulation system, whereas cognitive valences (extrinsic motivation) are created by a cognitive regulation system. Affective valences involve feelings about an action situation that rise automatically and irrespective of any act of will. Cognitive valences on the other hand involve active and conscious articulation and valuation of outcomes of an activity. The two regulation systems, though fundamentally independent, interact intricately. Combining affective and cognitive valences with approach and avoidance motivation, brought about by positive respectively negative valences, allows for all kinds of configurations of motivators, both mutually reinforcing and contrary, that have been identified empirically. The interaction between these valences leads to a valence expectation that determines readiness for action. Based on this conceptualisation an integration of different theories is proposed in a tentative model of task-specific motivation that, in addition to valences, includes personal and contextual facets of autonomy and competence, and relatedness and subjective norm.

Affects and emotions as driving forces in self-regulation and learning

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Former images of man as a cognitive machine in which emotions are only disturbing seem overcome at least, in the scientific community. Nevertheless, instead of the integration of different strands of psychology, the last decades were rather characterised by further fragmentation. We propose a model of action-regulation following approaches of action theory. Common core concepts of action theories are: (1) the horizontal subdivision of stages of action connected in a cybernetic model, (2) the structural analogy of acting, thinking, learning, and problem solving, (3) the vertical differentiation between conscious and unconscious regulation, and (4) an image of man in line with ‘constructivist’ perspectives. Apart from inconsistent terminologies, the framework of action theory still offers great potentials of integrating fragmented approaches from cognitive, motivation, emotion psychology and other branches of psychology. Within our contribution to the symposium we will outline our model of action-regulation and, thereby, emphasise affects and emotions as integral to acting, thinking, problem solving, and learning. Finally, we discuss exemplary implications for research on self-regulation, learning, and learning outcomes.

Towards a Theoretical Base for Motivational Regulation: an Integrated Model of Learning and Action

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This contribution aims to integrate affective and cognitive, conscious and subconscious processes of motivational regulation and learning into a common theoretical approach. Such integration is particularly grounded in action theoretical approaches. Research in the field of self-regulated learning has drawn on findings from action research. Respective metacognitive parts are nowadays integrated into almost all approaches to self-regulation learning (e.g. Winne & Hadwin, 1998). However, self-regulation theory has so far not undertaken a very consequent reconstruction of learning processes from a theoretical perspective. For this purpose, the Integrated Action Model presented by Martens and Rost (1998) is transferred to learning processes. The subsequent ideas are grounded in a theoretical model suggested by Kuhl (2000) and according to the Integrated Action Model these ideas are expanded to three process phases of a complete learning action: The motivation phase refers to the development of a learning motivation, i.e. the need arises to reduce a learning related existing discrepancy between the state as it is and the state that is desired. In the intention phase, a learning intention is created which can fulfil the learning motivation. In the volition phase, finally, a learning intention is translated into a real learning action. The proposed model was successfully applied in different empirical contexts and could trigger more empirical research, e.g. to explain different phenomena in the field of motivational regulation, e.g. stereotype threat, reinforcement effect on motivation, procrastination and probably many more.

Teacher Motivations in International Context

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Research on teaching has underlined the important role that teachers have in shaping students’ learning experiences. Much research on teacher effectiveness during the last two decade has focused on content and pedagogical content knowledge. This symposium conceives of teaching as more than just an intellectual activity; it argues that motivations are essential to teachers’ everyday work and shape teachers’ choices (Grossman & MacDonald, 2008). Together, the papers, including data from five countries, further our understandings of how teaching motivations and professional engagement shape individuals’ beliefs and behaviours. Paper-1 derives a motivational typology of preservice teachers in Germany and Austria, and relates these to achievement motivation, goal orientation, and general pedagogical knowledge. Paper-2 also adopts person-centred analyses to identify related preservice types in Croatia, and relationships with approaches to teaching and sense of efficacy. Paper-3 uses SEM to model longitudinal Australian data spanning up to 10 years, to examine how initial teaching motivations shape professional engagement at commencement of the teaching career, and self-reported teaching behaviours up to 8 years later. Paper-4 investigates relationships between teacher ability to analyze teaching and beliefs about mathematics teaching and career satisfaction, aspirations, and persistence among U.S. elementary pre-service teachers. Three projects include a common measure, the FIT-Choice Scale (Watt & Richardson, 2007) and all four papers include the PECDA scales (Watt & Richardson, 2008). Professor Butler’s commentary will highlight similarities and differences across national contexts and discuss directions for further research and implications for preparation of future teachers.
Profiles of Motivations for Choosing Teaching among Preservice Teachers in Germany and Austria

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What motivates people to take on a teaching career has been investigated in many studies and reports of empirical teacher education research from various countries. Empirical research studies on motivations for choosing teaching as a career usually contain descriptions of the frequency of preservice teachers’ motivations. Hardly any study, however, has used person-centered analysis strategies to identify groups of teacher education candidates with different profiles of teaching motivations. This presentation reports on an international comparative study conducted in 2011 in which teaching motivations of first-year pre-service teachers at 31 universities/teacher education institutions in Germany, Austria, and Switzerland were measured using the FIT-Choice scales (Watt & Richardson, 2007). Using the German (n = 4,402) and Austrian (n = 1,585) future teacher sample, findings from latent-class-analysis result in distinguishing five groups of future teachers, based on their profiles of teaching motivations. The profiles are primarily determined by future teachers’ intrinsic and social utility values as well as their motivation to choose teaching as a fallback and thus correspond to central assumptions of the integrative framework specified for choosing teaching as a career (Watt & Richardson, 2007). The typology is validated by using a variety of external measures such as future teachers’ achievement motivation, goal orientation, and general pedagogical knowledge measured by a paper-and-pencil test.

Motivations, Approaches to Teaching and Teacher Efficacy of Different Types of Preservice Teachers

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The aim of this study was to explore if different types of preservice teachers based on their motivation for teaching and perception of teaching career differ in approaches to teaching and perceived efficacy in the future teaching career. The sample consisted of 217 first-year students of teacher education programs for classroom teachers at three Croatian universities. The average age of participants was 19.45 years and 93.4% of the sample was female. We assessed motivations for the teaching profession using FIT-Choice as a theoretical framework. We also assessed approaches to teaching and sense of efficacy in future teaching. Our study provided insight into the clustering of various motivations for the teaching profession in first-year student teachers. Three clusters of preservice teachers were statistically and theoretically supported based on the participants’ motivation for teaching and their perception of the teaching career. The first type of students was
labeled ‘Pragmatically motivated student teachers’ (16.5%), the second ‘Averagely motivated student teachers’ (23.8%), and the third ‘Highly motivated first-choice student teachers’ (59.8%). The differential motivation for teaching profession was meaningfully related to the differences in students’ perceived efficacy in future teaching and in their approaches to teaching. Lower motivations for the teaching profession at the beginning of teacher studies seem to be associated with lower perceived efficacy in future teaching as well as with lower scores in student-centered approaches to teaching.

Initial Teaching Motivations, Professional Engagement, and Subsequent Teaching Behaviours

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Student teachers enter teacher education with various motivations to become a teacher. To what extent do these early motivations have an impact on long-term outcomes such as professional engagement at the outset of their teaching career, or teaching styles during their early career in teaching? These questions were addressed in a longitudinal study conducted with Australian participants who were followed from entry to teacher education (Phase 1), through degree completion (Phase 2), and up until 8 years of teaching experience (Phase 3)(N=311). Self-report surveys measured participants’ motivations for choosing teaching at Phase 1, professional engagement and career development aspirations at Phase 2, and teaching styles at Phase 3. Relationships between the three sets of variables were investigated using SEM analyses. The final model displayed good fit and shows interesting and intriguing results. Perception of ability at Phase 1 predicted later positive teaching behaviour, so did social utility value through its influence on participants’ planned persistence in the profession. Conversely, fallback motivations negatively impacted professional engagement and career development aspirations, and thereby lowered positive teaching behaviour. Social influences to become a teacher led to negative teaching practices; the negative effect of strong social persuasion needs to be kept in mind when encouraging students to choose the teaching profession. The results highlight an enduring effect of initial motivations for choosing teaching, that influence professional engagement and teaching styles up to 8 years later.

Knowledge, Beliefs, Self-efficacy and Career Satisfaction among US Pre-service Teachers

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Worldwide, there is recognition that successful school experiences for children rely heavily on the quality of their teachers (Ingersoll & Smith, 2004; Kennedy, 2008; Tatto, 2007). Teacher knowledge and beliefs have been found to be positively related to student learning outcomes (Hill, Rowan, & Ball, 2005; Philipp, 2007). We also know that knowledge alone does not motivate teachers to work in sometime challenging situations and to stay on the job. This project bridges research on teacher knowledge and beliefs and research on teacher motivations to better understand ways we can improve teacher preparation and retention. Participants are 66 pre-service elementary teachers enrolled in a fifth-year post-bachelor program at a U.S. West Coast public university. Several measures were administered at program completion to assess teacher knowledge, beliefs, self-efficacy, career-choice satisfaction and aspirations, and planned effort and persistence. Findings reveal positive relationships between self-esteem and both ability to analyze teaching and beliefs aligned with reform-minded teaching. In addition, overall high satisfaction with career choice and high aspirations were observed, but these are independent from level of knowledge and beliefs, and instead, seem to be related to positive feedback on performance. A future follow-up study will investigate whether these relationships change once teachers enter the profession and are faced with the daily challenges of their jobs.

**Intervention studies in writing-to-learn (part II): Effects on domain-specific learning outcomes**

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Writing-to-learn refers to the act of writing as learning activity aimed at increasing students’ learning in content areas. The premise of writing-to-learn is that writing is not a communicative tool only, but also an epistemological tool for acquiring knowledge, developing understanding, and improving thinking skills. This ‘learning through writing’ can be applied in all subject areas, ranging from science to literature, and at various educational levels. This symposium presents contemporary research about writing as a learning activity and aims at providing an overview of effective use of writing to enhance learning. It also focuses on the implications for educational practice. The symposium addresses four intervention studies in various subject areas that examine the effects of writing on different learning outcomes. The study of Van Drie et al. took place in history education and shows that a domain specific integrated writing instruction has a positive effect on students’ historical reasoning. Villanueva et al. focus on the effect of different approaches on science learning. Their findings suggest a positive effect of an expert-level writing approach on the development of conceptual ideas. The contribution of Ortoleva et al. is situated in the domain of health and social care and shows that writing about critical situations enhances students’ self-efficacy beliefs and procedural knowledge. Lastly, Rijlaarsdam and Couzijn present two studies testing the effects of genre instruction and writing/oral presentation on knowledge in linguistics and literature. They found
that writing outperforms oral presentation and that genre instruction has an additional effect on writing only.

Writing in history: Effects of writing instruction on historical reasoning

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Developing students’ abilities in historical reasoning is an important goal in history education. Writing can be considered an important means to engage students in historical reasoning. Since writing in history puts high demands on students, more insight is needed in how to support students when writing in history. In the study presented here, we focus on the role of instruction to improve students’ writing in history. In an experimental study we compared the effects of two types of instructions: a more general writing instruction and a more domain-specific integrated writing instruction on students’ writing in history. Participants were 29 students (pre-university education) who followed a lesson unit on determining historical significance and had to write an argumentative letter. These letters were analyzed on historical reasoning and overall writing quality. Results showed a positive effect of the integrated instruction on the quality of historical reasoning. No effects were found on writing quality. Although more research is needed because of the small sample, the outcomes can provide researchers and teachers with suggestions for promoting historical reasoning in writing.

Writing in science: Effects of writing on scientific understanding

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Many studies in science education and writing research have examined critique in separate domains, yet there appears to be a paucity of research that investigates how evaluation mediates students’ science understandings via text and other representations. Under the research programme of the Science Writing Heuristic (SWH), this study examines teacher implementation levels (e.g. novice and expert) of the SWH approach, and the effect their practices have on Grade 5 students’ development of conceptual ideas. Over the course of a unit on matter (novice) and seasons (expert), data from students’ writings and classroom observations were collected and analyzed qualitatively. The findings suggest that the students demonstrated phases of development relating to complexity of reasoning,
sources from which they constructed meaning, and use of diagrammatic representations. Students who engaged in the expert-level implementation of the SWH approach moved through five cognitive phases in their writing, whereas students from the novice-level group did not move past the early phases of cognitive and representational resources. Critical factors to students’ development of ideas appear to be teachers’ use of writing activities, and the manner at which writing was scaffolded and used in conjunction with inquiry and argumentation opportunities during the lessons. Given these findings, this study has implications for achieving current curricular standards for science and literacy

Writing in vocational education: Effects of peer feedback on learning and self-efficacy

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Vocational education usually alternates traditional concept-based learning and practical workplace training. The articulation between these two learning settings, considered key for sustainable learning, represents often a challenge for apprentices. This research proposes to use writing and peer-feedback as mediating tools to support learners in articulating conceptual knowledge and practical experience. A field study was conducted to evaluate the impact of corresponding pedagogical scenarios. Learners wrote about a critical incident occurred in the workplace, in relation to a specific professional procedure, and received peer-feedback, both in written and oral format. We analyzed apprentices’ self-efficacy beliefs and conceptual learning of the related professional procedures. Two classes participated in the activity, a first-year and a second-year class. The results obtained showed a significant effect of the scenario on the self-efficacy beliefs of the fist-year apprentices, as well as a positive impact on second-year apprentices’ understanding of the procedure discussed. These preliminary results comfort our general hypothesis that computer-supported collaborative writing scenarios represent a promising activity to effectively connect workplace and school settings. Additional analyses on apprentice’s subjective evaluation and contents of the texts produced will be discussed during the oral presentation.

Writing in linguistics and literature: Effects on knowledge, writing, and science literacy

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The pre-academic stream of Dutch secondary education prepares students for university studies. Conventionally, inquiry learning has a prominent role in science education and social subjects but hardly or not in the language and literature subjects. Yet, pre-academic students in language and culture must also be prepared for university education, during which they are to acquire a scientific approach to knowledge, study scientific publications, conduct some research themselves, and
synthesize their findings in writing. Because pre-academic education hardly provides language students with relevant inquiry tasks, many students in the pre-academic stream (who do not specialize in science) complete their education with little or no orientation on academic research. Therefore several lesson series were designed aiming at two goals: teaching students in pre-academic language arts classes to do inquiry tasks in the domains of linguistics and literature, and synthesizing their results in writing expository text. In two experiments, each with approx. 115 pre-academic students (grades 10-11), the contribution of inquiry (vs. a presentational learning mode) and writing expository text (vs. oral presentation), with or without genre instruction was studied on the outcome variables subject knowledge, writing skill, and science literacy. Results show that inquiry students outperform students in the presentational mode, that writing-to-learn yields higher learning effects than oral presentation, and that the effect of writing-to-learn is enhanced by genre knowledge.

Access points to scientific literacy: learning arrangements and students meaning making

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The importance of scientific literacy learning in school is a salient topic of discussion in educational science and policy. In the field of science education this concern is not new, but it has gained new currency in today’s media ecology where access to the internet make salient the unfolding character of scientific knowledge and the complexity of scientific issues through public debates. The most important aim of schooling, it has been argued, is to prepare students so that they develop into citizens who have an understanding of what it implies to take a scientific stance to a problem, how scientific knowledge is generated, how to critically scrutinize claims from different perspectives and how to discuss them in order to take a stand and exercise their citizenship. There are several ways through which teachers arrange for their students to become familiar with and develop scientific literacy. Through inquiry-based learning, project work on socio-scientific issues, virtual environments and tools, classroom activities and arrangements are re-organized for students to gain insight into the complexity of scientific knowledge and related societal issues. The aim of this symposium is to bring together on-going research in this field, and discuss what ‘access points’ to scientific literacy and learning that are made available for students through different pedagogical arrangements. In doing so, we take our point of departure in sociocultural, situative and pragmatic traditions and conceptualisations of learning focussing on students meaning-making and learning as an emergent property of different activities and arrangements.

Teaching and learning practice-linked environmental identities: A design-based study

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In project-based Environmental Science courses, students learn not only the scientific concepts and processes needed to understand the world around them, they learn their role and responsibilities as citizens in the ongoing interaction between humans and that environment, their ‘practice-linked identities (Nasir & Hand, 2008).’ An unintended consequence of increased understanding of environmental problems may be learning that one has no real role in addressing these problems, that one’s environmental practice has little effect or is too difficult to change. This multi-method study uses interview, video, and survey data to investigate the impact of changes in framing for transfer (Engle, Lam, Meyer, & Nix, 2012), including positioning students as decision-makers in the world outside of school, on students’ practice-linked environmental identities. Findings are discussed in terms of theories of transfer and engagement in project-based courses.

Remembering as access points for scientific literacy

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A central issue for educational research is how education may contribute to the personal development of children. A condition for developing such classroom practices is that access points to shared experiences are established in the classroom. The aim of this contribution is to illustrate how remembering can be understood as a situated and transformational activity shared by students and teachers in finding access points to scientific literacy. We ask how shared remembering functions as a pedagogical arrangement to make teaching experiences in science available for students’ continued reflection. Memories are often treated in education as entities being stored in the brain and which can be retrieved on demand. When approached from a sociocultural, situative and pragmatic perspective, memory does not come ready-made. Here, we draw on a six-week Chemistry project in primary school. We analyse one episode from a teacher-led group conversation where students report their ‘inquiry-home-work’ on the water-solubility of different food. This pedagogical sequence is an example of an arrangement with a purpose to make inquiry aspects of scientific literacy available to students through remembering. We find that the teacher draws on a broad repertoire of ways to construct a collective narrative of inquiry. The remembering requires joint negotiation of what is to be remembered. This joint negotiation has conceptual consequences in that it is simultaneously a negotiation of what instances qualify as examples of the phenomena of solubility and of what is necessary to make explicit in order to reflect upon the qualities of inquiry work.

Exploring computer-environments as support for students’ reflection on lab-experiments

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This paper reports on a study of students’ engagement with computer-environments aimed at enhancing students’ reflection on lab-experiments in school science. Research focusing on students’ use of these types of computer-tools shows divergent findings demonstrating both productive and challenging aspects. In order to gain a deeper understanding of these divergent findings, this study takes a socio-cultural approach. By performing detailed analyses of interaction taking place in a setting where students engage with a computer-environment aimed at supporting students’ reflection of a lab-experiment within the setting of forensic-medicine, the study aims at providing deeper insight into the very processes where students and their teachers employ these types of learning resources. While this study demonstrates how the computer-environment become a productive resource in the students’ reflection of their experiences from the conducted lab-experiment, it also echoes more challenging aspects, such as the considerable effort needed for students to make sense of the experimental-oriented procedures, as well as relating procedural activities to scientific knowledge. Furthermore, the study demonstrates how peer-collaboration and teacher intervention can prompt students to explicate their reflection.

**Socioscientific issues and access points to knowing: Exploring students’ meaning making in school**

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Bringing in socioscientific issues in a school context is bringing in a complex knowledge-intensive world. The accounts provided by teachers and schools for arranging extended project work on such issues very often echo Dewey’s concern for the need to re-organize learning on the basis of new principles. In this study video and audio data were used to follow students meaning making in interaction. The specific aim was to explore how the students engage with socioscientific issues and particularly what access points to scientific literacy they find and continue to explore as part of their project work inquiries. The results reveal several ways in which students become ‘triggered’ into an inquiry mode, as well as several ways they pursue an issue of concern through topicalization, exploration and semiotic coordination. Our knowledge of what might constitute ‘access points’ to scientific literacy from a student perspective is important when arranging for learning. The findings suggest a conversational culture and learning arrangement where stability and flexibility are equally important.

**Effective Reading Interventions in Primary Education**

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Radboud University, Nijmegen
Netherlands

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Radboud University, Nijmegen
Netherlands

Debra Myhill
Exeter University
United Kingdom
In this symposium four studies will be presented aiming at improvement of reading skills of primary school children. All studies provide insights into evidence-based practice and start from the perspective that engaging children in reading involves cognitive, social and motivational aspects (cf. Guthrie & Wigfield, 2000). Study 1 examines the effects of individualized versus small group guided oral reading on reading fluency, reading comprehension, reading attitude and vocabulary in poor decoders through grades 2 to 4. Study 2 studies the effects of a reading comprehension program for third and fourth graders in forty schools. In this program modeling of a limited set of reading strategies in an engaging context is central. Effects on knowledge of reading strategies, reading comprehension, decoding and motivation were examined. Study 3 investigates how the introduction of a reading task may influence reading motivation and reading comprehension of 6th graders when reading an expository text from the social science area. Introduction through a personalized letter along with hands-on activities (engagement condition) was compared to teacher-led class discussions on activation of prior knowledge of the topic of the text (prior knowledge condition) and a control group receiving no introduction. Study 4 focuses on the implementation of a school wide program to foster reading fluency in 21 elementary schools over a period of three years. The study focuses on changes in teacher behaviour during the implementation period as well as on learning gains of the students.

**Effects of Guided Oral Reading Interventions on Reading Skills of Poor Readers in Grades 2 through 4**

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Netherlands

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Guided oral reading offers a potentially effective remedy for low-achieving readers in the early grades of primary school. Guided oral reading implies that a student reads a text aloud while an experienced reader supervises the reading process, providing feedback or help when necessary. Two experiments are discussed. In the first, poor-reading students were randomly assigned two treatment groups and a control group. In the treatment groups, the intervention was delivered one-to-one, either in a repeated reading or in a continuous reading format. In the second experiment, poor-reading students were randomly assigned to a group-based guided oral reading condition and a control condition. Groups comprised three students who received an integrated version of continuous and repeated reading. Measures included tests for fluency, reading comprehension, vocabulary and reading attitude. The results demonstrate that both the individual and the group variants of guided oral reading are effective for improving fluency and reading attitude. Transfer effects on reading comprehension and vocabulary could not be established.

**Stimulating Reading Comprehension in Third- and Fourth-Graders**

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Netherlands

Willy van Elsacker  
HCO  
Netherlands
The purpose of the present study was to examine the effects of a reading comprehension program that focused on the instruction and modeling of a limited set of reading strategies in a motivating and meaningful reading context on reading abilities of third and fourth graders. The study was conducted in the Netherlands among 40 schools and 1469 children. Schools were randomly assigned to either the experimental or control group. The intervention was conducted during two school years. Measurements of reading comprehension, knowledge of reading strategies, reading motivation, vocabulary, decoding skills and non verbal IQ took place at the beginning and end of grade 3 and at the end of grade 4. Multilevel analyses showed positive effects on knowledge of reading strategies after one year of intervention at the end of grade 3. At the end of grade 4, there were also positive intervention effects on reading comprehension and decoding skills. No effects were found on reading motivation and vocabulary. Further no significant interaction effects were found with age, sex, educational level of parents, and cultural linguistic background (or ethnicity and home language) or non verbal intelligence.

**Effects of Different Ways of Introducing a Reading Task on Intrinsic Motivation and Comprehension**

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Roy-Petter Johansen  
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One-hundred and thirty Norwegian sixth-graders were randomly assigned to three different conditions where the same social studies text was introduced and contextualized by the instructor in three different ways. In the first condition, students were just asked to read the text in order to answer some questions and take a reading assessment afterwards (baseline condition). In the second condition, the text was introduced through the presentation of a personal letter relevant for the topic of the text as well as hands-on experiences with artifacts described in the letter (motivation condition). In the third condition, students participated in a brief, teacher-led class discussion to activate prior knowledge about the topic of the text (prior knowledge condition). Preliminary analyses based on data from 87 participants indicate that the three conditions did not differ with respect to intrinsic motivation for reading the text. However, the motivation condition and the prior knowledge condition led to better comprehension performance than the baseline condition. Thus, while not all experimental data have been analyzed yet, these preliminary analyses indicate that not only longer-term interventions but also the ways in which teachers introduce and contextualize a particular reading task can affect students' comprehension of what they read.

**Fluency in Reading**

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About 25% of the Dutch students leave elementary education with insufficient reading proficiency. Against this background a field experiment was conducted to improve reading performance in elementary education. During three years, twice a year, 90 teachers in 21 elementary schools were observed and coached in ‘fostering feelings of competence and self-confidence in students’, ‘classroom management’, ‘time on task’, ‘providing mini-lessons’, ‘talking with (groups of) students about their actual reading activities’, ‘retrospection with students on their reading activities’ and ‘repeated reading for students lagging behind’. Every year teachers had to fill out a questionnaire about ‘setting targets’, ‘monitoring student achievements and the amount and type of books read by their students’, ‘reflection on given instruction’, and ‘the construction of intervention plans for all students to prevent lagging behind’ (response to intervention). During three years, the teachers received feedback and coaching on their development in these skills. After 3 years teachers’ growth in observed behaviour varied between a half (time on task, mini-lessons, talking with students) and two standard deviations (repeated reading for students lagging behind). Teacher growth in self-reported behaviour on response to intervention varied from almost zero (intervention plans) to more than a standard deviation (setting reading targets). At the beginning and at the end of the experiment, reading fluency of more than 1800 students was measured with a standardized reading aloud test. At the end of the experiment 99.1% of the students leaving elementary education, reached sufficient reading proficiency.

Factors influencing strategy and representational choice in mathematics

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Variety in solution strategies and external representations are key characteristics of mathematical expertise. Consequently, one of the objectives in current mathematics education is that students adaptively choose between the different strategies and representations at their disposal. Recent theoretical and empirical investigations revealed that both task characteristics and individual performance characteristics influence children’s and adults’ choices. That is, a particular strategy or representation may be chosen more often on one problem type than on another (effect of task characteristics). Furthermore, an individual may choose the strategy or representation that has the highest performance for him or her (effect of individual strategy performance characteristics). This symposium consists of four contributions presenting empirical studies that further investigate the influence of these two factors on strategy and representational choice. The first two contributions focus on task characteristics alone, while the last two combine that with individual strategy performance characteristics, employing the choice/no-choice design. The contributions broaden and
Improve Bayesian reasoning without instruction: The impact of number lines

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When people make a decision under uncertainty based on information from different sources, their confidence in the correctness of their decision should depend on the source reliabilities. Two alternative ways of combining the source reliabilities are the averaging strategy, which is normatively incorrect, and the Bayes strategy, which is normatively correct. Previous studies with adults indicated that presenting the source reliabilities as absolute frequencies lead to an increased use of the Bayes strategy and that presenting the source reliabilities as percentages led to increased averaging. In the present studies we tested the hypothesis that number line representations aid magnitude understanding and, thus, lead to an increased use of the Bayes strategy in children and adults similar to the effect of absolute frequencies. In two studies we tested a total of 483 University students and 80 fifth-graders with a number of different decision scenarios which differed in the way the numbers were presented (absolute frequencies, percentages, number lines). Number line representations lead to the hypothesized increase in the frequency of the Bayes strategy in Study 1 but not in Study 2. The children used Bayesian reasoning more often than adults. One reason could be that the adults had greater knowledge about averaging and used it more often as result of an Einstellung effect. Overall, number representation formats, in particular, number lines, affect decision strategy choices at least under some circumstances. Thus, they offer means to affect children’s and adult’s strategy development, for example, in instructional interventions.

Multi-digit mathematics problems with or without a realistic context: Effects on problem solving

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Mathematics education and assessments increasingly involve arithmetic problems presented in context: a realistic situation that requires mathematical modeling. The present study’s aim was to assess the effects of such typical school mathematics contexts on two aspects of problem solving, performance and strategy use, with a special focus on the role of students’ language level. 685 sixth graders from the Netherlands solved a set of multi-digit arithmetic problems on addition, subtraction, multiplication, and division. These problems were presented in two conditions: with and without a realistic context. Regarding performance, the presence of a context increased the difficulty level of the division problems, but not of the other operations. Regarding strategy use, results showed that strategy choice was not affected by the presence of a problem context. Moreover, the (near) absence of context effects on performance and on strategy use held for different subgroups of students, with respect to home language and language achievement scores. In sum, the present
findings suggest that at the end of primary school the presence of a typical context in a multi-digit mathematics problem had no marked effects on students’ multi-digit arithmetic problem solving behavior.

623 – 199 = ? Efficiency and flexibility of children's strategies on multi-digit subtractions

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This study analysed children's use of mental computation strategies and the standard written algorithm in the domain of multi-digit subtraction, using the choice/no-choice method. Fifty-eight Flemish fourth-graders individually solved subtractions that either stimulated the use of mental computation strategies or the standard written algorithm, in one choice and two no-choice conditions. In the choice condition, children could use their preferential strategy on each item. In the two no-choice conditions, they had to solve all items with mental computation and the standard written algorithm, respectively. The results revealed that children applied the written algorithm very frequently and efficiently on multi-digit subtractions, even on subtractions that evoke mental computation. Furthermore, children did not take into account the numerical characteristics of the items during the strategy selection process, but fitted their strategy choices flexibly to their individual strategy accuracy and speed characteristics. We discuss the theoretical, instructional and methodological implications of these results.

Students’ representational choices: Teaching for flexibility

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This study evaluates the effects of an intervention aimed at improving representational flexibility in linear-function problems. Forty-nine students aged 13-16 participated in the study. A pretest-intervention-posttest design with an experimental and control group was used. At pretest, both groups solved a choice test in which for every problem they could freely select a table, a graph, or a formula. Moreover, they solved the same problem in three no-choice tests, where they had to use predetermined representations (either a table, graph, or formula). Twenty-five students in the experimental group were exposed to the intervention, where they learnt how to fine-tune their choices both to the task at hand and to their own characteristics as representational users. Students in the control group were not exposed to any intervention. Both groups were exposed to a posttest similar to the choice pretest. A flexibility score was calculated per student based on Siegler and Lemaire (1997). At pretest, the scores of both groups were comparable. At posttest, the
There is a constant concern in the field of higher education of how to improve students’ study success. However, predicting academic performance is complex in nature. Research on student learning has shown the importance of approaches to learning, teaching-learning environment and self-efficacy for study success but there are also contradictory results of these relations. This symposium explores the different factors (approaches, teaching-learning environment and self-efficacy) that have been found to be in relation to each other and to student achievement. In addition, the symposium examines the effect of generic skills and the change in student approaches to learning in relation to the study success and study pace. Furthermore, there will be discussion of the role of internship in relation to learning and study success. Finally, the direction of the effect between learning, teaching-learning environment and study success will be discussed. The symposium aims to bring important information of the factors effecting student learning and their academic success.

**Exploring the interaction between generic skills, approaches to learning and study success**

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Students’ generic skills have found to be in relation to deep-level learning but the research on their relation to better learning outcomes remains scarce. The aim of the present study is to explore students’ generic skills and their relationship between approaches to learning, study success and study pace. The participants were second year students studying humanities. The students filled in a questionnaire. The data were analysed by using correlations and regression analyses. The result revealed that surface approach was negatively related to the all variables measuring students’ generic skills. Study success was not in relation to approaches to learning not to the generic skills. Furthermore, the result indicated that critical thinking and ability to develop new ideas were generic skills that explained students’ study pace. There was no relation between study pace and approaches to learning. This study implies that critical thinking may require time and it may have implications for some students’ study progression. However, further research on the relationship between generic skills, approaches to learning, study pace and study success is needed.
The change in approaches to learning and its relation to learning environment and study success

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Previous research has shown individual changes in students' approaches to learning, but there is still a question of what causes these individual changes. The aim of the present study is to explore how changes in approaches to learning are related to students' perceptions of the teaching-learning environment and study success. Participants of the study were 103 students from the Faculty of Biological and Environmental Sciences who participated in the present study in their first and third year of studying. A modified version of the ETLQ questionnaire was used. The change variables were conducted and different student profiles were conducted using the classified change variables. The differences of the change profiles according to perceptions of the teaching-learning environment and study success were analysed by One Way Anova. Results of the present study show that changes in approaches were related to the students' perceptions of the teaching-learning environment but no relation to study success were found.

Predicting student teachers academic performance based on their learning strategies

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Many researchers have focused on the relationship between students academic learning strategies in (theoretical) classes and academic performance. However, within the research on academic performance little attention has been given to learning during internships. It has been argued that these internships make a distinctive contribution to professional education. In addition, it is widely recognized that internships play a major role within several teacher-training programs. The current study examines if academic performance of student teachers can be better predicted when learning strategies during internships are taken into account besides the learning strategies adopted in class. Students' self-efficacy, as an important predictor of academic performance, will also be considered. Participants in this study were 464 professional bachelor students enrolled in the teacher-training program. The results show that learning strategies in general are only able to explain a limited amount of variance in students' academic performance. In terms of students' self-efficacy it can be concluded that students self-efficacy during internships is the most significant predictor of their academic performance, a result in line with prior research.
A path model testing links between approaches, teaching-learning experiences and achievement

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The study examines the bi-directionality of relationships between students’ experiences of teaching and learning and approaches to learning and the effects of these variables on achievement. Two different three level models are tested with Structural Equation Modeling techniques. The Approaches and Study Skills Inventory for Students (ASSIST) and the Experiences of Teaching and Learning Questionnaire (ETLQ) have been used to assess approaches to learning and student’s overall experiences of the academic context. Approaches to learning and experiences of the academic context were explored as first and second level variables, alternatively. The findings indicated that there are bidirectional relationships between perceptions and approaches but the model that best fit our data was the one that presented approaches as a mediating variable. Variations in students’ perceptions seem to give rise to students’ approaches that affect achievement. The deep approach failed to influence achievement; there were no direct effects of experiences of teaching and learning on achievement; the indirect effects of perceptions on achievement through the strategic and the surface approach concerned ‘Congruence and coherence in course organization’ and ‘Integrative learning and critical thinking’. The indirect effect of experiences on achievement through approaches supports them as a dynamic construct influencing achievement.

Creating and implementing technology for early literacy

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While few scholars cast doubt on the potential of technology to support the language development of young children, appropriate uses of technology in preschools and kindergarten classrooms are subject to discussion. The (American) National Association of the Education of Young Children (NAEYC) recommends that software should be developmentally appropriate and support or extend the curriculum (1998, 2005). One of the main issues is how activities on the computer relate to the regular preschool and kindergarten curriculum and the teachers’ role in computer activities. This symposium features studies in which technology is used to foster early literacy development. Three studies focus on the interaction of pupils with specific software applications while a fourth examines the knowledge base teachers need to effectively use technology to foster early literacy. The first contribution addresses the precursors (of building blocks) for children to benefit from technology to foster early literacy development. The second study from the Netherlands and the third study from Israel focus on interactive digital story books as a means to foster listening comprehension and vocabulary acquisition. The second study investigates the potential of digital story books in a school setting and the third study investigates the use of these books in the home environment. The fourth contribution is a literature review on the affordances of technologies for early literacy development and commensurate knowledge needed by teachers to use such technologies well in the kindergarten.
classroom. The four studies are discussed from the perspective of young children’s interaction with technology.

**How self-control predicts early reading development**

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Self-control has shown to be crucial for the development of early reading. Attentional (cognitive) control processes such as suppressing irrelevant phonological codes are critical, and so is behavioural control for staying focused and performing tasks during reading instruction. Further, the increasing use of technology in early reading education puts high demands on behavioural control as computer-learning asks for a more independent learning role. In the present study we aimed to examine the relation between self-control and early reading into more depth, by investigating how attentional and behavioural control at Kindergarten longitudinally contributes to the developmental trajectory from Kindergarten phonological awareness to first-grade decoding and second-grade reading comprehension. Using Structural Equation Modeling, we found that the longitudinal influence of both attentional and behavioural control at Kindergarten to later decoding and reading comprehension was fully mediated by advances in prior reading abilities. Thus, children with higher levels of attentional and behavioural control in Kindergarten had an advantage during early phonological development, which in turn provided them with a stronger basis for the subsequent development of decoding and reading comprehension. Implications for early reading education through ICT will be discussed during the presentation.

**Preschoolers’ visual attention as a function of temporal contiguity between pictures and texts**

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In line with the dual-coding and the multimedia learning theories, it was hypothesized that children make stronger connections between the pictures and the text of storybooks when those are presented at the same time as compared to after each other during storybook reading. In Study 1, eye movements during the reading of one page of a book were recorded in 3 conditions in a between-subject design: the picture and the oral text presented simultaneously, presenting the picture first and then the oral text, and presenting the text first. In Study 2, looking behavior was monitored during 2 reading sessions of 3 storybooks in 3 conditions in a within-subject design: simultaneous presentation of pictures and text, text-first and a control condition. Additionally, word learning from the books was measured with self-constructed vocabulary tests. It was found in both studies that children in the simultaneous condition fixated longer in total at the parts of the picture that was mentioned in the text as compared to the text-irrelevant parts of the picture, which was not true for the non-simultaneous conditions. Moreover, children in the simultaneous condition fixated more often at the text-relevant parts of the picture as compared to the other conditions. A mediation model is tested in Study 2 with visual attention (partially) mediating the relationship...
between the pretest and the posttest vocabulary scores. Implications for the role of pictures in storybooks, the integration of visual and verbal information and the optimal reading environment supported by digital technology are discussed.

**Parent-child Reading of Electronic and Printed books as Support for Children’s Language**

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We researched the effect of mother-child e-book reading compared to printed book reading on child’s language development. Ninety pre-kindergarten children (aged 3-4) from a low socioeconomic status (LSES) and their mothers were randomly assigned to one of three groups: (1) Mother-child e-book reading (N=30); (2) Mother-child printed book reading (N=30); (3) Receiving the regular kindergarten literacy program (control) (N=30). Mothers of children in the intervention group (N=60) received short guidance in their homes on how to read to the child, and had five sessions of reading within a period of two weeks. The fifth reading session was videotaped and transcribed. Children were tested pre and post intervention in word comprehension and phonological awareness. Mothers in the e-book activity showed higher levels of mediation, however, this behavior did not contribute more to the child’s final language knowledge. Children in both activities progressed similarly in word meaning and phonological, awareness. Children’s initial level in the pretest in language measures contributed to their language progress following the intervention beyond all background parameters, including the parents’ education level. Children who started with the lowest grades were those who made the greatest progress. Furthermore, both book reading activities (electronic and printed) contributed significantly to the children’s language level beyond the background measures. We conclude that joint book reading nowadays may include printed books as well as e-books, and that both activities can serve as promising contexts for developing young children’s language.

**Towards a knowledge base for using ICT to foster early literacy development: A review study**

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A review study was conducted to describe the knowledge and skills teachers need for designing, organizing, and adapting technology-rich learning environments for fostering early literacy development in the kindergarten classroom. The sample consisted of 47 articles that reported on the affordances of technology in relation to kindergartners’ early literacy development. The review provides knowledge about effective ICT-characteristics (e.g., interface design) of computerized materials/technologies in relation to aspects of early literacy and contains guidelines for accompanying teacher activities in order to support the effectiveness of these technologies. Furthermore, the findings report on effective characteristics of technology-rich curricula, including the combination of on-computer and off-computer activities, in relation to children’s early literacy development and offer guidelines for designing and implementing technology into the context of kindergarten and/or adapting existing early literacy curricula. The synthesis of these findings in a
comprehensive TPACK framework includes knowledge about how to select appropriate ICT applications for early literacy development by taking into account particular child-characteristics, issues of classroom management, and theoretical notions about developmentally appropriate practices.

Multiprofessional collaboration in settings of extended education (all-day schools)

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Multiple changes in modern society place high demands on the traditional education system. As a reaction, the extension of learning time is a development that can be observed in many European countries as well as overseas. ‘All-day schools’ provide school- or community-based extracurricular opportunities, such as school lunch, homework time, and recreational activities, before and after official school hours. These different settings of extended education promise to boost student performance and to contribute to efforts of professionalization, but they also call for major structural and political reforms. Persons from different vocational backgrounds, such as education professionals, social workers, local industries are present in children’s school days. A lot of research has pointed out that to provide a program of good quality there is a need for collaboration between different institutions and players. In the studies, interprofessional collaboration refers to the interaction of two distinct groups of professionals, whereas multiprofessional collaboration entails more than two professional domains. Both forms of teamwork comprise exchange of information and division of work and promote professional learning processes. In this symposium, new empirical findings from three different countries will be discussed. One paper focuses on interprofessional collaboration between teachers and professionals from vocational institutes (Finland), and another on professionalization by multiprofessional collaboration (Germany). A third paper describes conditions of good collaboration (Switzerland), and the fourth contribution highlights possible ways of the further development towards ‘learning neighborhoods’ (Germany).

All-day schools as part of urban institutional networks for education and upbringing

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An efficient strategy to enhance educational chances and reduce social segregation requires integrated concepts on a local level including schools and other educational institutions. Although this is a widely accepted assumption, at least in Germany, we find many barriers and obstacles impeding collaboration and networking between schools and other institutions like sports clubs, youth and cultural institutions, health care, social services etc. Funded by the German National Ministry of Education and Research a study was carried out to analyse the process of networking of all-day schools in different social milieus to find out what kind of influences and conditions are determining the scope, the quality and intensity of collaboration between those institutions on the level of urban districts and neighbourhoods. The enquiries disclosed a whole series of transition problems relating to the change from half-day to all-day school but also structural problems in the educational system.

Conditions promoting good multiprofessional collaboration practices in Swiss all-day schools

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Multiprofessional collaboration in all-day schools refers to teamwork and coordination that takes place between professionals with different vocational backgrounds. In Switzerland, all-day schools comprise regular school instruction and school-based extracurricular activities. Nevertheless, multiprofessional collaboration can also refer to collaboration between education professionals in all-day schools and professionals outside the school in a community-based setting of extracurricular activities. A synthesis of the literature shows that collaboration inside and outside the school setting is promoted by conditions in three areas: structural characteristics of the institution, characteristics of the team, and interpersonal processes (Schuepbach, Jutzi & Thomann 2012). In view of these findings, it was the aim of this study to analyze conditions of good collaboration practices in all-day schools in Switzerland. This qualitative study examined 10 all-day schools in five different cantons in the German-speaking part of Switzerland that showed good collaboration practice. In the course of this study, we conducted 18 problem-centered interviews and 10 focus group discussions. In the process of data evaluation, we applied the method of qualitative content analysis. The findings show that all of the three areas of conditions promoting good collaboration proved to be relevant in the whole sample of all-day schools. Nevertheless, for the three different types of collaboration found—the school-oriented, the mixed/intermediate, and the social environment-oriented type—we identified different conditions of good collaboration practice.

Developing learning environments for low-motivated pupils in interprofessional collaboration

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The aim of this study is to describe how interprofessional collaboration can expand the learning environment of pupils in the national programme of Flexible Basic Education (JOPO). Here, learning environment refers to the overall setting of physical, psychological and social factors within which learning takes place. More specifically, we explore how interprofessional collaboration in the network of educational institutions promotes new activities of low-motivated pupils in lower secondary education. The study draws on activity theory, which allows us to examine human activity as a system. The researchers organised projects of developmental intervention between local
educational institutes. Health and social care students from a polytechnic as well as school assistant
students from a vocational college served as adults (coaches) for comprehensive school pupils in the
JOPO groups. Interprofessional core groups planned and supported their activities. The data is
collected by recording interprofessional workshops, interviewing the professionals involved and
observing JOPO groups in different learning environments. In addition, a questionnaire was sent to
comprehensive schools involved in the national JOPO programme. During this project the physical
learning environment of the pupils widened outside the school building. The JOPO pupils’ future
orientation and social relations strengthened because of the open encounters with the student
coaches and other professionals. Moreover, the developmental intervention enabled new internship
practices between the comprehensive schools and the vocational institutes. However, the
collaborating professionals didn’t have enough resources to be able to develop their curriculums.

Multiprofessional collaboration in German all-day schools

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Collaboration between occupational groups is an essential factor in German all-day schools. German
all-day schools offer a combination of lessons and extracurricular activities to the students, before,
during and after official school hours. Consequently, there is a need for collaboration between
teachers and other staff with varying qualifications and time resources. The paper gives an overview
of empirical findings of the research project ‘Professional collaboration between different
occupational cultures in all-day schools’ and the issues of multiprofessional collaboration in German
all-day schools. Five case studies of collaboration between occupational groups in all-day schools
were carried out in each of three federal German Länder (Brandenburg, Sachsen-Anhalt and
Niedersachsen). We recorded the schools’ perspectives on collaboration (teachers and school
management) and the perspectives of the internal and external collaboration partners. The focus of
the presentation focuses on two questions: Are the different actors’ conceptions of cooperation
compatible with each other? To what extent is cooperation between the different actors successful?
At the end of presentation it draws conclusions about the qualifications needed by teachers and their
partners.

Cognitive and educational outcomes of preterm birth.

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It has been well established that prematurely born children have an increased likelihood of cognitive and educational difficulties throughout childhood. As a result, preterm children may require additional support in a range of school subjects. Until now our understanding of the nature of these difficulties has been limited as studies have tended to focus on outcomes rather than exploring cognitive precursors and components of skills such as mathematics and reading. In this symposium we bring together four presentations which explore the cognitive and educational difficulties of preterm children in greater detail. The studies use a range of sensitive measures to understand 1) which components of mathematics and reading may be difficult for preterm children and 2) the cognitive skills which predict reading and mathematics outcomes in preterm children. We will discuss the implications of these findings for educational interventions to support preterm children in school.

Reading acquisition of Finnish very low birth weight children from pre-school to first grade

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Prematurely born children are at risk for various learning difficulties at school age. In reading acquisition, letter knowledge, speeded naming, and phonological processing measured at five years of age have been shown to predict reading. However, the relevance of these precursors has not been studied in VLBW children. The objective was to study reading acquisition of 127 very low birth weight (&le;1500g, VLBW) prematurely born children longitudinally from pre-school (5 years) to the first grade (7 years). The aim was to study the stability of pre-reading skills over time, and their relevance on development of decoding skills. Development was compared with 161 healthy full-term (FT) born children. Results showed that VLBW children had poorer pre-reading skills at the ages of five and seven years. There was positive correlation over time in letter knowledge and in phonological processing. In the first grade, there were more readers in FT children (52% vs. 66%), and VLBW
children were overrepresented in non-reader groups (48% vs. 34%). All pre-reading skills measured at the age of five correlated significantly with decoding skills both in VLBW and in FT children. VLBW children had an increased risk for difficulties in reading acquisition compared to FT peers. This difference was evident already at the age of five years. Importantly, VLBW children at risk for problems in reading acquisition can be identified already before they enter school, and they can be provided with appropriate support.

**Domain-general skills associated with academic attainment in very preterm children**

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Children born very preterm (VP, Eighty-seven VP children and 70 matched term-born classmates (aged 8-10 years) completed a battery of standardised outcome measures and domain-general tasks. Control children outperformed VP children in tests of Word Reading and Mathematical Reasoning, even after controlling for IQ. This study identified some common contributing domain-general factors for both control and VP children. We also identified that visuo-spatial skills were significant predictors of reading and mathematics performance for VP children only. This finding is discussed in relation to implications for interventions.

**Early mathematical skills of very low birth weight prematurely born children**

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Even though premature birth and very low birth weight (VLBW) have been generally known to be risk factors for academic achievement measured at school age, there still exists only a very limited number of studies on these children’s basic numerical skills before formal schooling. Here, two studies aim to examine preterm, low birth weight children in comparison to full term born children in basic numerical skills and general cognitive development at the ages of two (Study 1) and five (Study 2) years. The studies examine spontaneous focusing on numerosity, cardinality recognition, object counting, number sequence skills, and recognition of number symbols. IQ measures of children are used to test whether general cognitive development differs in the groups, and whether covarying of IQ would explain the group difference in numerical skills. Results show that VLBW prematurity seems to be a risk factor for the development of verbal number skills, at the age of 5 but not yet at the age of 2 years, similar to general cognitive development. The groups did not differ in any measures of spontaneous focusing on numerosity. Educationally, the findings suggest that early screening of VLBW preterm children for their numerical development already during preschool years could be recommended. This may help to target early intervention to these children’s numerical skills needing special support, and thus prevent later mathematical difficulties.

Identifying the nature of very preterm children’s mathematics difficulties

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Previous research has found that prematurely born children have difficulties in school with many academic subjects but show particular difficulties with mathematics. However this work has been unable to identify the nature of their mathematics problems due to a reliance on general standardized measures. This study aimed to identify specific areas of mathematics difficulty in very preterm (VP;

The Disfluency Framework Applied to Educational Settings: Which Cues Can Improve or Impair Learning?

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When students perceive information processing as fluent and therefore easy during learning, this perception of fluency may lead to an insufficient engagement in learning and concurrently a weaker learning outcome (i.e., illusion of understanding). An approach that is new to the context of learning and aims at reducing shallower processing that arises from this subjective feeling of ease is derived from research on disfluency (Alter & Oppenheimer, 2009) and uses metacognitive cues serving as a trigger for deeper processing. The contributions in this symposium address the issue of such cues altering recipients’ processing of given information from different angles. Different experimental manipulations as well as different methods are incorporated. The experimental manipulations range from perceptual disfluency to external cues and therein different types of pictures. The methods that are used start at basic research addressing the judgment of learning and evolve to more applied scenarios, such as learning with narrated visualizations and videos or learning from multiple documents that contain conflicting information. Bringing these approaches together, the symposium as a whole shows that the findings concerning disfluency obtained from other fields of research cannot simply be mapped to the context of learning and instruction. Therefore, each contribution also discusses reflections and initial steps towards a more differentiated view of applying the disfluency framework to educational settings. First and foremost this concerns the question of defining the when and how of implementing cues to foster students engagement in learning and the possible pitfalls this implementation may hold for learning.

When and How is Fluency Used as a Cue to Form Metacognitive Judgments of Learning?

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Judgments of learning (JOLs) are metacognitive judgments used to assess the likelihood of remembering studied information for a later recall test. They are often inaccurate at predicting actual memory performance. In order to improve accuracy, it is essential to understand the cues that learners use to form their judgments. Two investigations were designed to gain a deeper understanding of what cues relate to JOLs. The first experiment aimed to eliminate a metacognitive illusion-foresight bias by causing learners to use a fluency cue rather than a semantic association cue. This study manipulated fluency as a within-factor. The second investigation aimed to understand whether fluency was used as a cue to predict memory performance when it was manipulated as a between-factor. Results of these studies indicate that fluency only has an impact on predictions of performance when students have to study material that varies in fluency. If the study material has a constant fluency, fluency does not influence JOLs. Yet, in the latter case the diagnostic value of other cues (i.e., item relatedness & study time) increases.

Introducing Perceptual Difficulties Might Actually Hamper Learning with Narrated Visualizations

Cognitive Load Theory (CLT) has been challenged by research on disfluency, where making instructional material harder to read led to better learning outcomes due to a deeper processing. In the current study, it was examined whether these results could be transferred to spoken text. Thereby, we investigated whether a distorted spoken text (i.e., disfluent) would result in better learning outcomes, as would be in line with disfluency theory, or to worse learning outcomes, as
could be derived from CLT. In connection, if disfluency theory should hold true, the beneficial effects of a deeper processing of a distorted spoken text (i.e., disfluent) should become especially evident in a self-paced compared to a system-paced multimedia instruction. To address these assumptions, a 2x2-design was chosen, with quality of spoken text (regular vs. disfluent) and pacing (system-paced vs. self-paced) as independent variables. Concerning learning outcomes, a disfluent spoken text led to worse performance on a transfer as well as on a pictorial test, which is in line with CLT. In line with previous research, self-pacing led to better performance on retention and transfer tasks. However, other than assumed, no interaction of spoken text quality and pacing could be observed.

Using Other Cues than Perceptual Disfluency to Trigger Deeper Learning

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Perceptual disfluency can serve as an external cue for deeper processing of information (Alter, Oppenheimer, Epley, & Eyre, 2007) resulting in superior learning outcomes (Diemand-Yauman, Oppenheimer, & Vaughan, 2011). Beyond that, other external cues than perceptual disfluency such as furrowing one’s eye-brows or holding heavy clipboards were shown to trigger analytical processing. However, it was not yet investigated in how far other external cues than perceptual disfluency also resulted in better learning outcomes. To fill this gap, two experiments were conducted using external cues such as loading times of videos (Experiment 1) and chapter enumeration, comprehensiveness, and implied audience of textbooks (Experiment 2) to trigger deeper processing. In both experiments, it was hypothesized that external cues implying high complexity of the learning materials (e.g., longer loading times in Experiment 1; deeper chapter enumeration in Experiment 2) would result in superior learning outcomes. However, contrary to our expectations, none of the experimental manipulations in both the experiments impacted the students’ processing of the presented information with regards to the amount of invested mental effort, knowledge acquisition, and recognition tasks. The role of embodiment is discussed as one central cause of the observed results.

The Effect of Visualizations on the Processing of Conflicting Science-Related Texts on the Internet

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When learners search the Internet for information on scientific topics (e.g., risks of nuclear power), they regularly come across multiple texts communicating different viewpoints. More often than not, such texts also contain realistic pictures or graphs. To investigate the effects of these different kinds of visualizations on the comprehension of science-related texts on the internet, we conducted three experiments. In each experiment, participants read two magazine-like texts taking opposite stances on a scientific controversy in a web-based environment while the presence of graphs or realistic pictures was systematically varied. As dependent variable, the strength of the situation model for each text was measured by a verification task adapted from Schmalhofer and Glavanov (1986). Perceived plausibility of the texts, knowledge about scientific visualization conventions, prior domain knowledge, and the amount of web experience were used as covariates. The results of the first two experiments suggest that depending on the perceived plausibility of the texts, graphs can foster the creation of a strong situation model for texts with visualizations, whereas realistic pictures seem to be disadvantageous for the comprehension of web-based textual information. The preliminary results of the third experiment (including a trend analysis for plausibility and situation model strength) further support these findings. In addition, the content analysis of a reasoning task we conducted as part of the experiment suggests an effect of the type of visualization on conflict detection regarding the scientific controversy.

Assessing the effects of school and classroom factors on student engagement

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As a growing body of research support the pivotal role of engagement for learning, achievement, and drop-out (Appleton, Christenson, & Furlong, 2008; Fredricks, Blumenfeld, & Paris, 2004; Archambault, Janosz, Fallu, & Pagani, 2009), a better understanding of school and classroom influences on the different dimensions of engagement (behavioural, cognitive and emotional, Fredericks and Mc Closkey, 2012; Wang et al., 2011), is crucial for educational theory and intervention. However, most research on student engagement were cross-sectional studies conducted at the individual level. Therefore, the direction of the effects found remained elusive and contextual and climate effects could not be identified (Marsh et al., 2012). A few longitudinal or multilevel studies have highlighted the role of teaching practices in student engagement (Jang, 2012;
Marks, 2000; Skinner & Belmont, 1993). But no previous study has analyzed longitudinal data with a multilevel framework. Moreover, potential school or classroom composition effects were usually not well controlled in available multilevel studies on student engagement. By combining the strengths of longitudinal design and multilevel analysis, the papers presented in this symposium aim at extending our knowledge regarding (a) the size of school and classroom effects on student engagement, (b) the processes explaining these effects, with a focus on teaching practices.

**Teacher beliefs as predictors of adolescents’ cognitive engagement and achievement in Mathematics**

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The present study explored the moderating effect of teachers’ expectancies and general sense of efficacy on the relationship between students’ achievement and their cognitive engagement and achievement 1 year later. We used hierarchical linear modeling with a longitudinal sample of 79 mathematics teachers and their 1,364 secondary school students coming from 33 schools serving disadvantaged communities in Quebec (Canada). Results indicate that teachers’ self-reported beliefs directly influence student academic experience. However, they did not influence more importantly low-achieving than high-achieving students. Such findings suggest that in schools serving low socioeconomic status students, teachers should be made aware of the role their attitudes can play on students’ cognitive engagement and achievement. Special efforts should also be made to help them develop positive attitudes toward all students.

**Investigation of the effects of autonomy-support, structure and involvement on student engagement**

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The self-determination theory highlights the importance of autonomy support on students’ engagement (Reeve, 2009). If this theory also includes teacher’s provision of structure and involvement in its model, the effects of these practices have been less investigated, nor the interactions between them. Yet, the rare studies led showed significant effects: structure was significantly and positively linked with behavioural engagement and cognitive engagement, and teacher’s involvement with emotional engagement (Skinner & Belmont, 1993; Sierens et al., 2009). However these authors did not taken the nested structure of their data into account. The aim of the current study is to determine the main effects and interaction of the autonomy-support teaching, structure and involvement on engagement. Six hundred and fifty-five students from 57 classrooms
were asked to fill in a questionnaire assessing their perceptions of teaching practices and their engagement during mathematics lessons, in 7th and 8th grade. Multi-level analyses were used to take the classroom level into account. Results displayed a main effect of teacher structure on 8th grade behavioral and cognitive engagement, controlling for 7th grade engagement. Changes in emotional engagement were related to autonomy-support (negative emotions) and involvement (positive emotions). The results underscore the key role of structure at classroom level for behavioral and cognitive engagement, and the complementary roles of autonomy-support and involvement for emotional engagement. These results stress the interest of taking all these teaching practices into account to enhance students’ engagement.

**Learning environment experiences in primary education: their importance to academic engagement**

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Supportive teacher-student interactions are characteristics of a productive learning environment and are supposed to contribute to student learning. According to self-determination theory (SDT) teacher support (structure, autonomy) and teacher involvement/relatedness plays an important role in relation to the fulfillment of students’ basic psychological needs of autonomy, competence, and relatedness and, therefore, to students’ motivation and engagement for school. In addition, SDT emphasizes, in line with classroom environment literature, the importance of students’ perception of their learning environment. In the current study, it was investigated whether students’ perceptions of their teacher in relation to the satisfaction of their psychological needs of autonomy, competence and relatedness could explain differences in the (development of) students’ academic engagement at the end of primary education. Participants in the study were 777 grade 6 children of 41 classes in The Netherlands. Using multilevel modeling, attention was paid to unique and joint effects of these learning environment characteristics as well as to differential effects related to student gender, ethnic-cultural background and prior academic engagement. Results revealed important significant positive effects of all learning environment experiences (as perceived by students and related to their basic needs satisfaction) on (the development of) students’ academic engagement. Evidence was found for both joint and unique effects. Students’ learning environment perceptions related to their need satisfaction of competence and relatedness have the largest effects on (the development of) academic engagement. Almost no evidence was found for differential effects. Implications for teacher practice will be discussed.

**Do classroom goal structures really influence student emotional engagement?**

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Previous studies about impact of classroom goal structures on emotional engagement have only used individual perceptions to assess goal structures. Therefore it is not possible to differentiate the effects of environment from those of idiosyncratic bias and interpretations. Aggregated perceptions of goal structures at the classroom-level can thus be a more reliable indicator to investigate impact of goal structures on emotional engagement. Moreover, the effects of classroom goal structures have mainly been investigated on global measures of emotional engagement while other studies
have shown different effects of climate variables according to the discrete emotion considered. Consequently, this study aims to investigate, using a multilevel framework, the effects of classroom goal structures on global measures of emotional engagement but also on discrete emotions, controlling for previous emotional state. Eight hundred and fifty Belgian French-speaking students (7th, 11th grade) from 52 classrooms completed a self-reported questionnaire about their emotions, their perceptions of the goals emphasized by instructional practices in their classroom and the teacher-students relationship. Results of the multilevel analysis showed that goal structures as classroom-level constructs did not have the same impact on student emotional engagement than individual perception of these goal structures. It underlines the importance to analyse classroom climate variables using a multilevel framework. Findings show also different effects of classroom goal structures according to the discrete emotion investigated. Implications for future research and practice will be discussed.

Self-Regulation in Early Learning: Developmental Significance and Support In Preschool and Primary

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Self-regulation (SR) refers to individuals’ ability to control thoughts and actions to achieve goals and respond to environmental stimuli (Zimmerman, 2008). Effectively self-regulating individuals resist distractions, respond appropriately and flexibly to challenges, and delay immediate gratification to meet more important long-term goals. SR is associated with many positive outcomes (emotional, cognitive, behavioral, and social) throughout a lifetime. E.g., self-regulated learners experience high motivation and confidence and engage productive skills and strategies, leading to task relevant behavior and high levels of achievement (e.g., Hadwin et al., 2010). In the early years, SR predicts success in school even more powerfully than children’s IQ scores and knowledge of reading and math at school entry (e.g., Blair & Raza, 2007). These findings signal the importance of research aimed at understanding how SR develops and can be promoted. Papers in this symposium focus on these issues with particular emphasis on teaching and learning in the early years. Specifically, they describe how: (a) gesture and early language support SR in very young children (14 months to 7 years; Whitebread et al); (b) varying profiles of SR are implicated in kindergarten children’s adjustment to and success in school (Hutchinson et al.); (c) SR is affected by contextual and interpersonal supports in primary classrooms (M&exe;xb4;&exe;xb4;&exe;xb4;&exe;xb4;&exe;xb4;&exe;xb4;tt&exe;xb4;&exe;xb4;, et al.); and (d) teachers’ beliefs concerning child characteristics are reflected in their SR promoting practices (Peeters et al.). Together these papers and comments from our discussant, Dr. Helen Patrick, will illuminate a critical role for children’s developing SR within 21st Century education.

Developmental trajectories of gestures and speech as self-regulatory tools in problem solving
Self-regulation develops through early childhood, and predicts achievements in social and cognitive
development. Vygotsky proposed that language serves as a cognitive tool for self-regulation, in
particular, language directed at oneself, to guide one’s own actions and thoughts. Several studies
report positive associations between language and self-regulatory behaviours, but the underlying
mechanisms by which children benefit from the use of language during problem solving, in real time,
remains largely unexplored. Furthermore, language is not the only semiotic tool serving a self-
regulatory purpose. Recent research indicates that gestures also contribute to learning and problem
solving, especially in spatial cognition tasks. However, studies associating pre-linguistic gestures and
self-regulation are sparse. In this paper we discuss whether pre-verbal children use gestures as a tool
for self-regulation, how gestures are integrated with spoken language when used for self-regulation,
and how these important skills develop through early childhood. We present an innovative approach
in analysing the co-occurrence of communicative utterances, both speech and gestures, and self-
regulatory behaviours coded in real time during naturalistic playful cognitively challenging tasks from
three ongoing studies with children aged 14-18 months, 3-5 years and 6 years. Patterns of children’s
gestures and speech, self or other-directed, and self-regulatory behaviours have been identified and
qualitatively analysed. We propose an integrated developmental account of gestural and verbal
communication as self-regulatory tools. Our results suggest that pre-verbal children can use gestures,
vocalizations and early words with a self-regulatory purpose, and gestures are still used by verbal
children if appropriate for the task.

An Investigation of Young Children’s Self-Regulation and Its Relation to Early Success in School

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Self-regulation (SR) involves metaconition, motivation, and strategic action and is associated with a wide range of positive outcomes across a lifetime. In kindergarten, SR is associated with children’s achievement in and adjustment to school, including positive relationships with teachers and peers. Our presentation describes results from the first wave in a 3-year longitudinal investigation of young children’s developing SR. Participants were 126 kindergarten children and their teachers (N = 18). At Time 1, teachers evaluated various aspects of their students’ self-regulation in school, including their emotion and behavior regulation, self-regulated learning, and socially responsible SR. Results indicated that SR was a statistically significant predictor of academic achievement and school adjustment for these children. Also, teachers gave statistically significantly lower ratings of SR to boys, but not to students from low socio-economic communities or diverse cultural and linguistic backgrounds. Finally, in our results we identified a subset of children teachers rated ‘at risk’ in their development of self-regulatory processes. Our presentation will elaborate profiles for these children and plans to follow them from kindergarten through grade 3 to learn how their currently potentially problematic trajectories are influenced by their experiences in school.

Young children documenting their experiences of success: What triggers young children’s SRL

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Previous research has shown that young children are capable of regulating their learning in a strategic manner if the learning context is designed to support self-regulation. The aims of this study were to investigate young children’s self-regulatory behavior in efficacious interaction situations and to explore the factors in these situations that support young children’s succeeding in self-regulation. The participants (n = 24, children aged 6 to 9 years) from four primary school classrooms were videotaped during seven weeks in authentic formal learning contexts and interviewed about their experiences of success, joy, and achievement in formal and informal learning contexts using photo elicitation interview. The results showed that young children experienced succeeding by themselves, with the help of an adult, and together with peers. Four types of self-regulatory behavior comprising emotional, prosocial, cognitive and motivational elements were found. Also, three triggers for supporting young children’s self-regulatory behavior, namely individual, peer and contextual trigger were found.

Primary Teachers’ Beliefs About the Promotion of Self-Regulated Learning with At Risk Students

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Reducing or eliminating the impact of students’ background characteristics on academic achievement remains one of the major challenges worldwide. Research repeatedly illustrated the positive effect of self-regulated learning (SRL) on students’ intrinsic motivation as well as academic performance. Developing SRL skills of students at risk for educational failure, might therefore contribute to closing the achievement gap. Regardless of teachers’ overall positive orientation towards the promotion of SRL, several processes still obstruct congruence between teachers’ beliefs and their actual SRL practices. The present paper focuses on student background as a potential obstacle in or incentive for SRL promotion. The study explores teachers’ personal beliefs about enhancing SRL with students from low socio-economic and/or different ethnic background. Respondents were 127 primary school teachers questioned through semi-structured interviews. Results show that teachers differ in their beliefs about the nature and extent of the impact of students’ background on the promotion of SRL in their classroom practices. Data partly explain these differences by revealing variation in teacher trust in students. Furthermore, respondents mainly depicted individual teacher characteristics to affect their SRL promotion. Skills to facilitate SRL development, perceived benefits of SRL for at risk students and previous experiences with fostering SRL were most often referred to as crucial elements of facilitating SRL. The study contributes to school policy and practice by providing input for the development of learning environments facilitative to inclusive SRL development ultimately aiming at eliminating the achievement gap.

About task settings likely to promote an accurate use of monitoring and self-regulation strategies

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Concerned with a variety of complex learning tasks, the four presented papers commonly suggest that high cognitively loading tasks may not only lower students’ learning outcomes, but also, may influence the use of metacognitive skills, mainly monitoring (Maillard et al.; Baars et al.) and self-regulation (Amadieu et al.; Schwonke et al.). Importantly, however, the four papers also indicate that with regard to complex and cognitively demanding tasks, performance and metacognitive skills like monitoring and self-regulation can be aided by i) increasing the students’ prior knowledge (Amadieu et al.); ii) implementing partially worked-out examples (Baars et al.); iii) providing external guidance instructions (Schwonke et al.); and iv) adjusting the learning procedure to learners’ expertise level (Maillard et al.). In sum, beyond educational implications regarding the ways to enhance students’ learning outcomes, this symposium provides critical comments on those task settings that are likely to promote students’ accurate monitoring and self-regulation, that is, task settings likely to enable the use of learning strategies that are necessary when facing complex learning environments.

How does concept map format and expertise level affect learning and self-evaluation?

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The goal of this study was to show whether a concept mapping task can improve both learning outcomes and self-evaluation. It has been assumed that constructing concept maps helps learners to have a more accurate meta-comprehension. In parallel, the theory of expertise reversal effect suggests that the same tools can be beneficial for novices but detrimental for experts. Thus we predicted that the format of concept mapping task would produce different effects on learning performance and self-evaluation according to the expertise level of the learner. More precisely, the consultation format would lead to an increase for novices (but to a decrease for experts) in both learning performance and self-evaluation accuracy while the construction format would have a reverse effect. All participants watched text processing-related videos, performed a transfer task and answered self-evaluation-related and mental load-related questions. Both novice and expert students were divided in five groups: two groups had to construct a concept map during or after the video, two groups had to consult a concept map during or after the video, and one group was a control group without any concept mapping task. Data are still being collected, but the educational implications of this study are at least two. First, the format of concept mapping tasks should be adjusted as a function of learners’ expertise level, given that wrong format may hinder performance and self-evaluation in both novices and experts. Second, the expertise reversal theory applies also to metacognitive abilities and allows for investigation of self-evaluation processes.
Completion of Partially Worked-out Examples as a Strategy for Improving Monitoring Accuracy

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A student’s own assessment of how well information is learned is called a Judgment of Learning (JOL). JOLs need to be accurate if a student is to make an accurate judgment about what information needs to be restudied or practiced further. However, students often make inaccurate JOLs. Therefore, it is important to investigate how to improve JOL accuracy, but such studies have almost exclusively focused on word pairs and text. Studies with texts have shown that generation strategies, such as generating keywords, or concept maps, can improve JOL accuracy. The present study investigates whether JOL accuracy when learning to solve problems through worked example study can be improved by a generation strategy consisting of completing blank steps in the examples. Ninth grade students either studied worked examples or completed partially worked examples and gave JOLs. It was found that completion of worked examples resulted in underestimation of future test performance.

Does elaborating concept maps in hypertexts support comprehension?

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Concept mapping is a learning task that requires learners to build themselves a graphical representation of the concepts and their relations from text materials. The current experiment addressed concept mapping in a hypertext environment. Eighty high school students had to study the greenhouse effect from short texts (i.e. concepts) and to build a concept map (i.e. organizing a given set of concepts by drawing links between them). When readers have great cognitive resources, building a map is expected to promote relational processing of concepts and hence support deep comprehension hence. Comprehension (as tested by text-base and inference questions), cognitive load (perceived complexity and feelings of disorientation scales), building activity (number of concept moves and of links drawn) and two individual differences variables (prior domain knowledge and reading skills) were assessed. Correlational analyses confirmed that the more participants built the map, better was their comprehension. Considering the different moments of the learning task, a better performance was linked to a higher number of concept openings (i.e. reading of texts) early in the task and to a greater building of a map later over the task. The test of mediating effects revealed that prior knowledge supported better comprehension through this greater building of a map later over the task. Moreover, a high cognitive load was linked to a lower engagement in the building of the map. These findings argue for great cognitive resources as a condition to benefit from concept mapping in a hypertext environment through the use of efficient processing strategies.

A Changing Emphasis-Approach Applied To Learning From Multiple External Representations

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Many learners have difficulties in acquiring knowledge from multi-representational learning materials. In an experiment we have examined the effects of a changing emphasis-approach on learning from complex static learning materials. Participants in the changing emphasis group (n = 12) were instructed to focus their attention to a set of worked-out examples (learning domain: analysis of stock charts) consisting of a main stock charts and two supportive charts on the relationship of the main chart and one of the supportive charts. After one minute study time participants were instructed to change their focus of attention to the relationship of the main chart with the other supportive chart. A control group (n = 12) studied each example for two minutes without any special instruction. During the learning phase eye movement data were recorded. In a post test the changing emphasis group outperformed the control group in applying their knowledge to similar problems. The changing emphasis group as compared to the control group spent higher percentages of overall dwell time on elements congruent with the emphasis instruction and switched more often between instruction-congruent elements. Congruent dwell time and gaze switches were positively correlated with learning outcomes and negatively related to subjective ratings of intrinsic load, which was
negatively correlated with learning outcomes. The effects of the changing emphasis-instruction on learning outcomes are attributed to a relieve from self-regulation demands and a reduction of interferences impeding information intake and integration, and by this, hindering the construction of coherent mental models.

The Educational Practices Series: A publication of the International Academy of Education

Stella Vosniadou  
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Greece

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The purpose of the symposium is to make known to the EARLI community and members the Educational Practices Series. The Educational Practices Series has been developed by the International Academy of Education in collaboration with the International Bureau of Education, a part of the United Nations Educational, Scientific, and Cultural Organization (UNESCO). The purpose of the series is to provide concise and timely synthesis of research on educational topics of international importance and to draw out the implications of this research for the development of effective practices that improve learning. The booklets are written by international experts in the field of learning and instruction and are distributed free of charge by the International Bureau of Education to teachers all over the world.

The Educational Practices Series: Purpose and Scope

Erik De Corte  
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Belgium

Stella Vosniadou  
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The purpose of the Educational Practices Series (EPS) is to provide concise and timely synthesis of research on educational topics of international importance and to draw out the implications of this research for the development of effective practices that improve learning. Containing only about 5,000 words, the booklets can fit in a pocket or purse. This concision is intended to save educators’ time and to complement larger works, which are referenced in the booklets. Easy to translate, the small booklets are cheap to reproduce and republish, which any education agency is free to do provided it omits nothing. The success of the booklets depends on their grounding in solid research and the wide applicability of their principles in educational and related settings throughout the world.
Emotions and Learning: Ten Principles

Reinhard Pekrun
University of Munich
Germany

Recent research has shown that emotions can strongly impact students’ learning, educational careers, and well-being. In this presentation, I will discuss ten evidence-based principles that integrate current knowledge about students’ emotions and consider practical guidelines for educators. Pekrun’s (2006) control-value theory of emotions is used to organize the available evidence. Principles 1 to 3 address the nature, diversity, and assessment of student emotions. Principles 4 and 5 summarize the evidence on the functions of these emotions, arguing that it would be ill-conceived to consider positive emotions as generally adaptive and negative emotions as generally maladaptive. Principles 6 and 7 consider individual antecedents, such as achievement goals, self-confidence, and academic values, and ways to regulate student emotions. In Principles 8 to 10, practical guidelines are discussed. These guidelines consider how teachers can foster students’ adaptive emotions by providing high-quality instruction, displaying positive emotions, using adequate ways to evaluate student learning, involving parents, and contributing to school reform.

Knowing and Raising Intelligence

Andreas Demetriou
University of Nicosia
Cyprus

This presentation aims to enable teachers, first, to understand what we know about the organization, functioning, and development of intelligence and, second, guide them in their attempt to systematically boost intellectual functioning and development of their students. We outline the processes involved in intelligence (representational capacity, inference, specialized domains, and consciousness), their relations and development and the factors that may influence them and cause individual differences in each of them. Specific interventions that would boost each one are also presented. It is argued that schools must focus equally on knowledge, learning to reason, and learning to learn to fully meet their purpose in the knowledge society.

Nurturing creative thinking

Eleni Berki
UNIVERSITY OF TAMPERE
Finland

Panagiotis Kampylis
European Commission, Joint Research Centre, Institute for Prospective Technological Studies
Spain

This booklet focuses on eight key principles that primary and secondary teachers can realise for cultivating creative thinking in students. These principles are mainly inspired from a review of research on creativity and innovation in education and on classroom practices, as well as from authors’ own experiences as educators. The eight leading principles are universal and easy to follow. They are summarised next: promote creativity in all school subjects; design creative learning spaces; increase the use of open questions; provide meaningful to the students activities; enhance creativity through collaboration; use available tools and technologies creatively; allow mistakes and sensible risk-taking; and, last but not least, assess and reward creativity. These manifold principles aim at triggering teachers’ reflection on their everyday practices and encourage them to arrange creative
thinking activities that offer authentic, interdisciplinary, open, and pleasant learning experiences to all students throughout the entire curriculum.

**Studying Teaching Competence in Mathematics Classrooms Cross-nationally**

Yoshinori Shimizu  
University of Tsukuba  
Japan

David Clarke  
University of Melbourne  
Australia

Gabriele Kaiser  
University of Hamburg  
Germany

The four studies reported in this symposium represent different but related analyses undertaken as part of the Learner’s Perspective Study (LPS) (Clarke, Keitel & Shimizu, 2006). Among the research foci addressed within the LPS are the related issues of teaching competence. The teachers in each education system participating in LPS were identified for their locally-defined ‘teaching competence’. All four studies make use of the extensive data set generated by the LPS. Data generation conformed to a common research design focused on sequences of at least ten lessons, documented using three video cameras, and supplemented by the reconstructive accounts of classroom participants obtained in post-lesson video-stimulated interviews. The first paper draws on multiple analyses to argue that distinct discourses exist in any cultural setting in and about the mathematics classroom and that both discourses frame the realization of teaching competence in different cultural settings. Teacher questioning is a familiar focus in discussions of teaching expertise and the second paper examines the multi-functionalility of teacher questioning in one Japanese mathematics classroom. Learning through discovery is less uniformly endorsed and less widely practiced and the third paper analyses attempts by a competent teacher in the Czech Republic to facilitate student discovery of mathematical knowledge. The final paper examines competence in a Hong Kong mathematics classroom through one teacher’s reflection on video records of his own practice and through the reflective accounts of his students. Audience participation is essential to the exploration of what these different approaches contribute to our understanding of classroom competence.

**Competent Mathematics Teaching as a Cultural Artefact**

David Clarke  
University of Melbourne  
Australia

Cultural norms and values are among the most significant determinants of judgements of competence in educational settings. Such judgements of competence are made on the basis of presumptions of good practice that derive directly from the local history of educational practice. In this presentation, I examine both classroom discourse and professional discourse about classrooms. Both discourses constitute forms of social performance undertaken within affordances and constraints that can be both cultural and linguistic. The nature of those discourses performed in mathematics classrooms provides a key indicator of pedagogical principles underlying classroom practice and the theories of learning on which these principles are implicitly founded. In combination, these pedagogical principles and theories of learning determine local ‘competency standards’ as these are performatively realised in the classroom. The discourses about mathematics classrooms give expression to these pedagogical principles by encrypting privileged forms of practice.
in the naming conventions by which the mathematics classroom is described. Research will be reported to suggest that each of these discourses is culturally and linguistically specific. As a consequence, conceptions of accomplished practice (or excellence) are contingent on the history of custom and insight embedded in the conventions of practice and the language with which that practice is described. Using the promotion of fluency in spoken mathematics as an analytical reference point, it is clear that competence in teaching mathematics is differently realised in mathematics classrooms around the world. In addition, mathematics teachers in different countries have very different linguistic tools by which to conceptualise their practice.

Teacher’s Questioning as a Window for Examining Teachers’ Competence

Yuka Koizumi
University of Tsukuba
Japan

Yoshinori Shimizu
University of Tsukuba
Japan

Mathematics teaching is situated in a specific cultural setting and has evolved in ways that are valued in that culture (Stigler & Hiebert, 1999). Consequently, a ‘competent’ teacher can be valued and conceptualised in different ways in different cultures. From this point of view, it is interesting to observe that Japanese teachers share several pedagogical terms for describing the teacher’s key roles during classroom instruction with particular conceptualization of her role. The term ‘Hatsumon’, which means asking a question in Japanese, is often used for describing teachers’ key questioning that provokes students’ thinking at a particular phase of the lesson in order for attaining the major goal of the lesson. The current study analyses teacher’s questioning in a Japanese mathematics classroom taught by a ‘competent’ teacher. This study draws on the data from a 8th grade classroom that is a subset of the data in the Learner’s Perspective Study. Major roles of teacher’s questioning were identified and discussed. First, it plays the role of problematizing students’ thinking with the task posed in the lesson. Second, it gives a clue to the students who are faced with difficulty in solving the mathematical task. Third, it focuses on the processes of students thinking while they solve a problem, and provide an opportunity for them to look back their own process. The analysis suggests that timing and content of questioning are keys to understand the competence of a teacher who has clear ideas on how students’ learning should be facilitated in classrooms.

Differences and Similarities in Competent Teachers’ Strategies: The Case of the Czech Republic

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Learning through discovery in various forms is recommended in the literature as good practice. It is closely related to the philosophy of social constructivism. Unfortunately, this practice is rather rare (not only) in Czech schools. Teachers usually feel unsure whether the time needed for the pupils’ own discoveries has been used efficiently. The proposed presentation focuses on analyses of didactical situations that were planned by the teacher with the objective of making the pupil discover mathematical knowledge on their own. Data generation was based on Learner’s Perspective Study
(LPS) framework. Both classroom and post-lesson data were analyzed. The theoretical framework for the analyses is the Theory of Didactical Situations (Brousseau, 1997). Particular attention was paid to situations of institutionalization that have often been found to be problematic. The following questions provide an entry point for the exploration of classroom competence: . Which forms of the institutionalization of knowledge did students discover for themselves? . How did the students and their teacher perceive institutionalised mathematical knowledge? From consideration of these two questions, in relation to the documented mathematics classroom, it is possible to construct, problematize and extend contemporary ideas of competent mathematics classroom practice in the Czech Republic.

A Story of His Own Lesson: An Example from Hong Kong

Ida Ah Chee Mok
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China

Cultural norms and values are among the most significant determinants of judgements of competence in educational settings. Such judgements of competence are made on the basis of presumptions of good practice that derive directly from the local history of educational practice. In this presentation, I examine both classroom discourse and professional discourse about classrooms. Both discourses constitute forms of social performance undertaken within affordances and constraints that can be both cultural and linguistic. The nature of those discourses performed in mathematics classrooms provides a key indicator of pedagogical principles underlying classroom practice and the theories of learning on which these principles are implicitly founded. In combination, these pedagogical principles and theories of learning determine local ‘competency standards’ as these are performatively realised in the classroom. The discourses about mathematics classrooms give expression to these pedagogical principles by encrypting privileged forms of practice in the naming conventions by which the mathematics classroom is described. Research will be reported to suggest that each of these discourses is culturally and linguistically specific. As a consequence, conceptions of accomplished practice (or excellence) are contingent on the history of custom and insight embedded in the conventions of practice and the language with which that practice is described. Using the promotion of fluency in spoken mathematics as an analytical reference point, it is clear that competence in teaching mathematics is differently realised in mathematics classrooms around the world. In addition, mathematics teachers in different countries have very different linguistic tools by which to conceptualise their practice.

Finding ways of improving creative learning and the development of creativity in school

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The aim is to present different ways for schools to improve students’ creative development and learning. A question is: In what ways do schools encourage students’ creative development and in what ways do they in fact discourage creativity? The first perspective concerns the role of meta-cognition in fostering creativity. Meta-cognitive strategies enhance some creative mental operations but is counterproductive to others. Diverse enhancement strategies are thus recommended. The second perspective regards the need for dynamic lesson design to encourage creative learning. Often stereotypical models of lessons guide teachers in their lesson designing, but with informative instructions, teachers may increase the variation in their lesson designs. The third perspective shows how self-assessments of students’ idea production are vaguely related to teachers’ perceptions. The perceptions of students’ idea production are also analyzed in relation to an objective creativity test. The results demonstrate a need for teachers to be trained to recognize creative students’ ideas. The fourth perspective describes students’ and teachers’ notions on creative classroom situations. Students applauded creative situations and believed that they enhanced learning. Teachers demonstrated interest in creativity but showed little confidence in their classroom practice in relation to developing creativity. The educational relevance regards the alarming lack of methods in school of how to work with students’ development of creativity, despite the fact that most National curricula include learning objectives related to creativity. Scientifically, these four perspectives represent innovative ways of meeting the need for methods to enhance creative development and learning in schools.

Enhancing students’ creativity through self-reflection: Effects of a metacognitive training

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An experimental study was carried out to assess whether primary school children’s creative abilities can be enhanced adopting a metacognitive approach. The study consisted of three phases. Initially students completed a test measuring the initial levels of creative skills, meant as the capacity to perform the three basic mental operations (widening, connecting and reorganising). In the second phase students were involved in the training, consisting of activities aimed to increase the aforementioned creative abilities. In the last phase the creativity test was administered again. Half of the students were asked, during the training, to answer metacognitive questions before and immediately after each activity. The questions stimulated reflection on the skill, effort and satisfaction relative to the activity and were intended to induce children to predict and reconstruct retrospectively the thinking processes activated. The other half of children followed the creativity training without metacognitive hints. Results showed that the metacognitive approach promotes only one aspect of creativity, namely the widening of the mental perspective, whereas it is counterproductive to reorganization. Furthermore, it was found that the ability to predict and reconstruct mental processes can be progressively refined. Findings support the notion that metacognition is useful to stimulate only some of the skills implied in creativity. Thus, teachers who wish to promote children’s creativity should diversify the training approach (metacognitive vs. non metacognitive) according to the kind of mental operations which are implied in the tasks to be performed.

Provoking creative lesson designs by inhibiting schema-based processing

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This paper reports two studies that investigate creativity in the process of designing lessons. Based on a previous study and the theory of mental models (Seel, 1991) it is assumed that lesson designs often are not creative enough to meet the demands of the given conditions and learning objectives to be reached, because they are mainly schema-based. However, creativity and thus, mental modeling is needed in order to compose creative and efficient lessons. Two control-group research designs were developed in order to identify possibilities of inhibiting schema-based lesson designing and hence, induce the construction of a mental model in order to design creatively. Our first study with 42 teacher and instructional design students focused on the effectiveness of a specific instruction for designing lessons. In the second study a treatment to overcome schema-based lesson designing by presenting schema-non-conform information about pre-conditions is tested for its effectiveness on a sample of 231 teacher students. Preliminary results indicate that a specific instruction for the design of lessons is not efficient in terms of provoking creative lesson designs. However, schema-non-conform information within the design task seems to provoke creativity in lesson designing.

The relation of creative self-efficacy and creative thinking in Estonian students

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The report focuses on the results of a study, undertaken among Estonian secondary school students (n = 250, age 15 to 17 years), in order to investigate possible interconnections between one’s subjective evaluation of his/her creative self-efficacy, and objective evaluation of creative thinking, measured by a standardized test. The instruments used in the study, involved Torrance Tests of Creative Thinking (TTCT) as an objective measure of creative thinking, and creative self-efficacy questionnaire, developed for the purpose of the study. The questionnaire focused on students’ self-evaluation of creativity and production of novel ideas, as viewed by peers, school teachers, and friends. The results of the study show that there is modest correlation between self-evaluation of own creativity and creative thinking: for girls, components of creative thinking subscales were positively correlated with their opinion that they propose original ideas at school, according to their peers, teachers, and friends. For boys, such correlations did not appear. There were no significant differences between students with high and low creative thinking results, in terms of proposing novel/original ideas in school, according to their fellow students, teachers and friends. Girls tend to propose more novel/original ideas among friends, based on friends’ opinion. Boys tend to propose more novel/original ideas at school, based on teachers and their own opinion. Possible reasons and implications of these findings to classroom and teaching environment are discussed.

Teachers’ and students’ perceptions of creativity related situations in a Swedish classroom

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Sweden

The aim was to study critical creative moments (CCM:s), that is creativity related situations, in 5th grade classrooms and discuss these with teachers and students. Two observers visited each of the two classrooms on four different occasions in different types of classes (different subjects). The
lessons were videotaped and the creative moments were identified by the observers during the live observation sessions and during repeated video reviewing. The teachers and students were shown short videos and were asked to comment on them. Four teachers and 35 students were observed and interviewed. The results demonstrated both encouraging and discouraging CCM:s. Some of the positive CCM:s took place as a result of active pedagogic strategies from the teachers but most CCM:s were initiated by the students and arose accidentally in the classroom. Comments from the school actors revealed that teachers in general were positive towards creativity as a phenomenon and did appreciate or at least tolerate creative moments as they arose naturally in the classroom (e.g. students joking or taking creative breaks playing with erasers). Students were of the opinion that the positive creative moments facilitated learning. Teachers were not conscious of what strategies possibly could be creativity squelchers. Neither were they aware of active strategies for stimulating creativity in the classroom. The most alarming finding was that not once during the observations was creativity encouraged directly. The participants, both students and teachers - believed that more creative pedagogical methods could be used to a larger extent than was done today.

Using rubrics for formative purposes: mapping the process

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This symposium discusses rubrics from a formative perspective, i.e., how rubrics can be used as a tool to guide and support student learning. In order to understand the potential added value of rubrics in supporting learning, it is important to map the different processes that take place when using rubrics (see Figure 1). The first three processes (construction, implementation, and use) can take place in various ways. For instance, rubrics can be constructed by researchers, teachers, and/or students. Together, the contributions of the proposed symposium cover all processes depicted in Figure 1. The aim is (1) to coherently describe the state of the art of research with respect to rubrics for formative purposes, (2) to present and connect result of different studies concerning rubrics that were done in different domains, and (3) to point out important directions for future research regarding rubrics, in order to better understand their possible benefits (or risks). The first contribution, a literature review, provides insight in how rubrics can be constructed and used, and how the use of rubrics can impact learning. The second contribution, comprising three case studies, concerns various ways for implementing rubrics and how using these rubrics is perceived and evaluated. The third contribution, based on questionnaire data and grades, regards how students used a rubric and how this relates to feedback perceptions, students’ prior knowledge and learning outcomes. Lastly, the fourth contribution provides insight in how students used and evaluated a set of rubrics integrated in a large-scale assessment programme.

The Quality and Effectiveness of Rubrics for Formative Use

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Rubrics are much used in classrooms in North America, in both basic and higher education. Is this practice useful? This paper reports on a review of studies of the quality and effectiveness of rubrics in the North American literature. Many rubrics found in practice are not well-constructed, and these can lead students to focus on ‘scoring’ rather than ‘learning.’ However, well-constructed rubrics do give sound information about students’ work. They are most effective when used throughout the learning process, in a formative manner. They help students conceptualize the learning target and monitor their own progress. Ultimately, the same rubrics can be used for summative assessment.

Rubrics as a Way of Providing Transparency in Formative Assessment

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There is no easy way to convey the meaning of goals (or intended learning outcomes), criteria, and standards to students. On the contrary, there are a number of studies highlighting the difficulties students encounter when trying to decipher feedback and the content of course documents. Still, there are some studies showing that when sharing scoring rubrics with students, they tend to appreciate the transparency provided and sometimes they also perform better when having access to a rubric. Furthermore, in a couple of studies, students’ self-regulation strategies have improved when using rubrics. As can be seen, there is some kind of paradox in relation to transparency, where students on one hand do not seem to understand the goals, criteria, and standards, but on the other hand, they appreciate transparency and are also, at least under some circumstances, able to actually use this transparency to affect their learning. The purpose of this paper is to discuss this paradox in relation to a case-study investigation of how rubrics are introduced, as well as used and perceived by students, in professional education. By investigating three teachers’ implementation practices in detail, along with students’ perceptions of clarity and usefulness of the rubric, this study adds to the current scientific debate on how to improve students’ understanding of criteria and feedback through the use of rubrics, as a way to support students’ learning in higher and professional education.

Students’ use of a rubric for research papers

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Rubrics may function as an assessment tool for teachers, a tool to make students aware of what is expected from them or to let students get familiar with criteria, a tool to interpret the feedback that a student receives from a teacher, and an assessment tool for students to review the products of their peer in a peer assessment setting. The purpose of this study is to examine whether students use and value these different function and whether their evaluation is related to their ability. A two page rubric for research papers was developed based on the APA manual. Students completed a questionnaire on the role of the rubric while working on their research plan, giving and receiving peer reviews, and working on their thesis, and a questionnaire on feedback perceptions of both the
peer and teacher feedback. Factor analysis on the quantitative data yielded four factors (start learning the criteria; judging, underpinning, and providing advise on the work of peers; understanding feedback on own work; understanding and applying the criteria). Results indicated that students did value the rubric for all these functions. A small negative correlation was found between grade for their research plan and applying and understanding criteria. It also appeared that rejection of the feedback was negatively correlated with final grade for the bachelor’s thesis. Based on the results, the rubric should be further developed, with more concrete examples of the different levels of the rubric and an additional level to measure excellent performance.

The use of rubrics for programmatic assessment in the workplace

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Learning in the clinical workplace is far less structured than during the preclinical, theoretical phase of the medical curriculum. There are specific challenges to be overcome in designing an effective programme for work-based assessment in the clinical workplace. The main challenge is to structure assessments in such a way that, despite differences between learning environments, all students are stimulated to work towards the required competency levels and have sufficient opportunities to demonstrate that they have attained them. In this study we investigated the use of rubrics in an assessment programme for formative and summative workplace-based assessment. The rubrics defined the competency level to be attained at the end of the clerkship and were guiding the students’ learning process. Data on students’ experiences and perceptions on the use of rubrics in the assessment programme were gathered using questionnaires and focus group interviews. Students were positive about the assessment programme and the guiding role of the rubrics, in particular when there was a discrepancy between the student’s self-reflection and the results of the formative assessments for which the rubrics provided a framework. In the eyes of the students the holistic assessment procedure that is based on the principles of qualitative research is robust for taking high-stakes decisions in work based assessment. We think that this learner led approach contributed to the perceived learning value of the assessment and the congruence between the assessment program and the different learning environments of the students.

Medical education: Bridging the gap between empirical findings and educational practice

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Education in the medical professions is highly relevant as it has direct consequences for life and health of patients. Consequently, research on medical expertise and its development has a long tradition. This symposium addresses the question how to translate findings from the laboratory into educational practice. Two eye-tracking studies show that advanced knowledge structures (illness-scripts) result in changes in visually processing and diagnosing pictorial (Kok et al.) and textual patient information (Mikkilä-Erdmann et al.). The instructional study by Helle et al. showed that it is worth to 'take a second look' at medical images; also in an inverted position! Conclusions for educational practice are to provide diverse medical images which can be rotated and reviewed for learning; and to adapt the difficulty of medical texts to medical freshmen. The presentation by De Leng et al. bridges the gap between empirical findings and educational practice by implementing blended learning into a curriculum. Supported by Mikkilä-Erdmann et al., who show that the biggest challenge for medical residents are cognitive and work overload, De Leng et al. reduce such load by using virtual patients. Moreover, supported by the findings of Kok et al. and Mikkilä-Erdmann et al. they foster advanced knowledge structures by guiding students’ learning with illness-script-grids. This symposium shows the continuum from experimental laboratory research to actual instructional interventions and brings expertise theories, empirical research and educational practice closer together.

Looking in the same manner but seeing it differently: Bottom-up and expertise effects in radiology

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The use of eye-tracking methodology in medical education has a long history, but took a flight in the last decade due to technological advances in eye-tracking technology. Eye-tracking has played an important role in the development of models of expertise differences. However, many models of expertise differences in radiology do not take into account visual differences between diseases. We investigated the effects of three types of images on viewing patterns of students, residents and radiologists: focal diseases (localized abnormality), diffuse diseases (distributed abnormality), and images showing no diseases (normal). Despite of large performance differences, we found remarkably little differences in the eye movements of students, residents, and radiologists, especially for focal and diffuse diseases. For normal images, performance differences between the three groups were smaller, but differences in eye movements were larger. Our findings are in line with other studies showing that students develop the ability to detect abnormalities before they are able to accurately diagnose these abnormalities. We add to the current expertise theories the importance of taking into account visual differences between diseases, and we suggest that based on our results, education is required that not only focuses on diseases, but also includes images that show normality.
Facilitating symmetry detection of novices in thoracic radiology through instructional design

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The purpose of the present study was to examine whether a practical observation reported by radiologists actually holds: expert radiologists report that it is easier to detect asymmetry between the ribs and the spine if the thorax image is rotated by 180°. Presumably, rotating the image prevents the activation of pattern recognition of normal anatomy. An alternative explanation is that simply taking a new look from a fresh perspective increases symmetry detection. The present study examined whether switching has the alleged (positive) effect. Moreover, we investigated whether the potential positive effect is this due to orientation, or switching specifically from upright to inverted - as proposed by expert radiologists (see Fuller, 2009); or simply due to taking a fresh new look. The study consisted of two experiments (N = 30 + 30) including a short intervention to familiarize participants (university students) with reading of thorax images. Results indicated that viewing the same image twice significantly increased sensitivity, while viewing the same image in an inverted position significantly improved specificity. The results suggest that ‘taking a fresh look’ improves the detection of asymmetries in thorax images. To conclude, manufacturers of learning environments should consider adding rotational and masking features to learning environments intended for medical images.

Residents’ processing of patient cases and experiences in medical training

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This study is part of larger research project (LeMEd) on learning medical expertise. Its aim is to provide insights for educational practice on both, a detailed, information processing perspective but also a long-term perspective. In the current study, we first investigated differences between medical freshmen and residents in actual processing of written patient cases. Second, we determined challenges medical residents face in their education overall. Participants in this study were 14 residents and 31 third year medical students in an internal medicine program in Finland. First, participants interpreted two written patient cases while their eye movements were recorded. After that residents were interviewed about their professional development and experiences. Our results revealed that residents are excellent in conducting diagnoses compared to novices and their reading times are significantly faster and qualitatively different. Thematic analysis of the interview data revealed three main categories of experiences: 1) challenges because of studying the complex field of internal medicine, 2) stress because of the long days and cognitive overload, 3) problems of work-life-balance. In internal medicine residents have to cope with huge amount of knowledge and ill-defined problems under time pressure. Long working days including on-call duties seem not to offer enough time for systematic studying and learning. Residents seem to have difficulties to concentrate on the essential aspects of the internal medicine in the everyday rush. They also seem to need more individual feedback and direct teaching of practical clinical skills. Also discussions with colleagues concerning patient cases were suggested.

More grip on patient problems with scripts and grids? Using grid exercises with virtual patients

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In a design-based research project, we designed and evaluated a blended learning scenario on diagnostic reasoning skills for novice medical students. The blended learning scenario is based on educational strategies recommended by Bowen (Bowen 2006) and the concept of ‘illness scripts’ (Barrows & Feltovich, 1987), while the cognitive load is minimized by using a virtual patient format. Groups of 10-12 students solve a comprehensive integrated puzzle (Ber, 2003) by completing a grid of diagnoses against ‘illness script’ dimensions. After two days of self-study, subgroups of four students work-up a virtual patient by engaging in a compound learning activity to 1) obtain information from the patient’s history, physical examination, and other investigations, 2) summarize the findings, 3) compare and contrast diagnoses in a repertory grid exercise (Chu, Hwang, & Tsai, 2010), and rank the differential diagnoses by probability. Evaluation using a student questionnaire and group discussion resulted in a rating of 8.3 (ten-point scale) and suggestions for improvement of the scenario. The results provide input for the next (February 2013) large quasi-experimental study of 1) effects of the comprehensive integrated puzzle on students’ approach to exploration of the patient problem and the quality of the summaries and 2) effects of the repertory grid exercise on the quality of the diagnostic ranking. This step will inform further refinement of the design and provide more general insights into effective educational strategies to enhance students’ diagnostic reasoning skills.

The attitudes-achievement-paradox: How to interpret correlational patterns in cross-cultural studies

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This symposium provides new insights into both substantial and methodological problems related to cross-cultural comparisons of educational systems. Many international studies, such as the OECD Programme for International Student Assessment (PISA) and various studies run by the International Association for the Evaluation of Student Achievement (IEA), have produced seemingly paradoxical findings when relating student achievement to non-cognitive outcomes, e.g. student motivation, and perceived quality of the learning environment, e.g. student ratings of teacher-student-relations. When running analyses on the student level, working with pooled international data, or separately within countries, the relationship between such attitudinal variables and student achievement most often proves to be significantly positive. However, when aggregating on the country (and sometimes the school) level, relationships tend to be reversed. For example, the higher the mathematics achievement level of a country, the lower (!) the mean value of student interest in mathematics, as measured by typical Likert-type questionnaire scales. This phenomenon has been called the
‘attitude-achievement-paradox’, and it has raised severe concerns about the validity of findings from international comparative surveys. Researchers have attributed the phenomenon to culture-specific response styles, such as extreme response style (ERS) or acquiescence (ARS), that may bias responses to Likert-type items. As a consequence, attempts have been made to adjust for response style, or to replace Likert-type items with new item formats. The symposium provides an overview of findings related to the paradox, discusses explanations and presents recent advancements in developing questionnaire scales which ensure coherence between various levels of analyses.

The meaning of cross-national differences in response styles: Evidence from large-scale surveys

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There is a renewed interest in the cross-cultural analysis of response styles, including acquiescent, extremity, and mid-scale responding; social desirability can also be seen as an example. The interest is triggered by findings that there are systematic, in some studies large cross-cultural differences in these styles. The presentation will deal with the still elusive question of the meaning of response styles. On the one hand, there is the traditional and still widespread view that response styles are distortions that impact the self-reported expression of norms, values, and behaviors. Response styles are then to be reduced or even eliminated. On the other hand, there is the view that response styles reflect culturally preferred ways to communicate with unknown persons, such as interviewers and researchers, so as to establish culturally desired images of the self. I will give a brief overview of cross-cultural studies of response styles, evaluate the evidence in favor of both viewpoints, and present country characteristics that are known to be systematically related response styles. Data are derived from studies such as the OECD’s student assessment PISA and teacher survey TALIS, the World Values Survey, and other large-scale surveys. I will argue that if we want to continue to use Likert scales in these surveys, the traditional approach will continue to prove fruitless. It is more productive to treat response styles as culturally influenced filters that cannot be avoided and that it is more productive to develop ways to factor these styles into our assessment.

Overclaiming: A new technique for correcting for response tendencies in international assessments

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The overclaiming technique (OCT; Paulhus, Harms, Bruce & Lysy, 2003; see also Zimmerman, Broder, Shaughnessy, & Underwood, 1977) is a method that can be used to estimate both respondents’ concept familiarity and their tendency to overstate what they know. It does this by collecting recognition judgments for intermixed concepts and foils. We created an OCT test to estimate
secondary student respondents’ familiarity with mathematics concepts (e.g., polynomial function) on an international large-scale mathematics assessment by intermixing such concepts with foils (e.g., proper number). For each concept and foil, participants indicated familiarity on a 5-point scale (from ‘never saw it’ to ‘very familiar with it’). Familiarity level responses to the foils can be used statistically to adjust familiarity level responses to the mathematics concepts to get an unbiased concept familiarity measure. In addition, claimed familiarity with foils can be treated as a kind of acquiescence bias or overclaiming tendency. We present results from the PISA 2012 Field Trial based on data from 67 countries and N=34,902 students. Results indicate that claimed familiarity with mathematical concepts was highly correlated with mathematics achievement scores at the individual level, but much less so at the country level. However, adjusting students’ familiarity ratings of mathematical concepts based on that student’s responses to foils resulted in higher correlations with achievement at the individual level and especially at the country level, due to country-level differences in acquiescence. We review these findings, discuss implications, including for conditioning responses to other self-report questions, and present results for such conditioning.

Using anchoring vignettes to detect and correct for response styles in PISA questionnaires

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In PISA and other large-scale assessments, a quite robust phenomenon is a reliable difference between individual and national level relationships for certain questionnaire scales (e.g., Loveless, 2006; OECD, 2011). A question is whether this reflects true differences between countries in attitudinal factors (e.g., high achieving countries have worse attitudes towards mathematics) or merely a method artifact. If the issue of cross-cultural differences in survey response styles is not considered, and existing response styles are not corrected for, secondary analysts who use attitudinal data are at risk of reaching erroneous conclusions (Buckley, 2009). There can be, for instance, considerable differences in how students from different countries interpret the response scale. Anchoring Vignettes (e.g., Chevalier & Fielding, 2011; King & Wand, 2007) have been successfully used in various fields of survey research, but so far not in educational large-scale assessments. In this paper, we compare different anchoring methods based on data from the PISA 2012 Field Trial. Results indicate that anchoring vignette type items could considerably improve the cross-cultural comparability of student background questionnaire scales. Substantial gains in measurement precision and validity could be achieved. Correlations with proficiency strongly aligned on the individual and the country-level for anchored, but not for unanchored Likert-scale responses. These results seriously question the validity of country-level comparisons of noncognitive indices based on unanchored scores. Implication of these results for future design of noncognitive assessments, especially in the field of international large-scale assessments, will be discussed.

Towards improving the cross-cultural measurement of interest in mathematics

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Interest in mathematics is not only considered to be an important predictor or correlate of performance in mathematics but also an essential non-cognitive outcome (e.g. Lipnevich et al. 2011; Ma&Kishor, 1997; Ma&Xu, 2004; NCTM,1989; OECD, 2010). Hence, its reliable and valid
measurement not only within but also across countries is of interest to international studies in education, such as the Trends in International Mathematics and Science Study (TIMSS) and the Programme for International Student Achievement (PISA). In the field trial for PISA2012 three ways of measuring ‘Interest in mathematics’ were designed and administered. This was done to address the phenomenon whereby this construct - together with other attitudinal student background constructs - was shown to be linked to performance in unexpected ways. More specifically, at the between-country level, countries that demonstrated higher performance in a subject showed less positive attitudes towards that subject whereas more positive attitudes were recorded for lower-performing countries using a split-ballot multi-trait, multi-method (MTMM) design (Saris, Satorra & Coenders, 2004; Saris & Gallhofer, 2007). From the initial analyses of the data (Lietz & Tobin 2012) considerable differences in the size of factor and methods correlations emerged for Finland and Tunisia. In fact, for Tunisia, the methods factors overrode the trait factor. In this paper, data will be analysed further with a latent class factor model (LCM, Vermunt, Magidson & Inc, 2004) to ascertain whether these newly developed ways of measuring ‘Interest in mathematics’ are more appropriate than previous measures as regards validity and reliability.