

Multimodality After the Hype: Trust, Ethics, and Real-World Learning in the AI Era

The question is no longer whether multimodal data has value; the critical challenge is how it becomes a trusted, human-centred component of supporting learning and interaction. Continuous physiological and behavioural sensing is already normalised through everyday wearables. In complex learning environments, AI and multimodal analytics allow researchers to examine learning as lived experience rather than as a final outcome: moments of effort, shifts in attention, uncertainty, coordination, breakdowns, and recovery. Yet meaningful use requires more than analytical power—it requires ethical grounding, interpretability, legitimacy, and social accountability.

Within this development, I see Europe at a particularly critical moment. The EU Artificial Intelligence Act explicitly limits what can be inferred and acted upon in learning contexts. Emotion-related data provides a striking example: emotions matter deeply for learning, yet biometric emotion recognition in education is prohibited because of risks of discrimination, manipulation, and power imbalance. The Act protects learners, but simultaneously reshapes what becomes possible. It forces us to confront difficult questions: What forms of support remain acceptable? And how do we defend dignity while advancing capability?

In this keynote, I draw on our research group's empirical multimodal work in demanding contexts, including Finnair Flight Academy and vocational medical education in Finnish wellbeing region organisations. Eye-tracking, HRV, and interaction analysis reveal how people regulate attention under pressure, manage cognitive load, collaborate in tightly coupled teamwork, handle uncertainty, and regulate emotional responses—while gradually developing expertise and resilience that remain invisible to traditional assessment. Based on these examples, I reflect on how multimodality can strengthen learning design, professional learning, competence development, and performance safety. Ultimately, I consider what trustworthy AI grounded in multimodal understanding should enable—and what it should responsibly refuse—as we shape learning cultures where capability, protection, innovation, and humanity genuinely coexist.

About

Full professor Raija Hämäläinen works at the intersection of digitalization, learning, and interaction at the Faculty of Education and Psychology, University of Jyväskylä, Finland—an institution known for world-leading research in learning, teaching, and professional development. Her expertise lies in technology-enhanced and workplace learning. She founded and leads the TEL research group, bringing together scholars interested in how technology reshapes learning and interaction. She has led multiple research projects funded by the Academy of Finland, the EU, and other national funding agencies. Her long-term research agenda examines learning, teaching, and interaction processes in higher education and workplace settings. International collaboration is

central to her work, including joint projects and high-impact publications. Learn more about the TEL-Group.

Hämäläinen is an established keynote speaker on innovative methods, with appearances at EARLI 2021, International VET conferences, RWL 2026, and EARLI SIG 27. She also contributes to the field as Associate Editor of Educational Research Review (IF 10.207), profiling area leader in JYU LearnDigi, and WP leader in the InterLearn Centre of Excellence.

Her current work spans AI in education, PIAAC adult assessment data, and multimodal methods. She welcomes inquiries about research collaboration and research visits. PhD applicants are encouraged to connect their interests to ongoing projects in AI for Education, workplace multimodality, higher education pedagogy, and longitudinal studies on digitalization and learning difficulties.