

## **Fostering Meta-Cognition Skills through Smart Technologies**

Today's organizations increasingly need employees who are able to deal with fast-changing environments and solve non-routine problems. Consequently, the focus in education needs to shift away from helping learner to acquire factual knowledge towards the training of so called meta-cognition skills, such as communication, argumentation and problem-solving. According to predominant constructivist learning theories, students need individual interaction with a personal tutor to best train such meta-cognition skills. However, educational institutions such as high schools, vocational schools, and universities struggle to offer this kind of individual support due to financial and organizational constraints. The growing number of classroom sizes in high schools and vocational schools, mass lectures at universities with more than 100 students per lecturer, and massive open online courses (MOOCs) with more than 1,000 participants make individual interaction with a teacher or tutor even more difficult. The tension between increasing student-educator ratios and the need for individual interaction raises the question of how to offer individual support to students to enable them to gain the necessary meta-cognition skills. One solution to this dilemma is leveraging the potentials of novel smart technologies to account for the existing boundary conditions (increasing student-educator ratios), and at the same time allow for the design of individual learning experiences independent of class-size and learning context. In this research talk, I will present insights from two recent studies. The first study focuses on using Smart Personal Assistants (SPAs, i.e. Amazon's Alexa) to foster problem-solving skills among learners. The results of two field quasi-experiments show that learners who used an SPA experienced a significantly higher increase in their problem-solving skills over the course of five weeks, compared to a treatment group that received traditional paper-based learning materials. Furthermore, insights from focus group interviews show that SPAs positively influence the learning process. The second study focuses on formative feedback provided using text mining approaches to foster argumentation skills. The results from a laboratory experiment and a field experiment show that learners who received tailored formative feedback on their written argumentation develop better argumentation skills compared to learners who use an alternative tool or who are in the control group.