Technology-Enhanced Collaborative Learning for Improved Interactivity, Collaboration, and Flexibility in Higher Education and Corporate Training

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Current position and research within ITEC

I am Postdoctoral Researcher in instructional psychology and – technology and co-PI within the ITEC research group at the University of Leuven (KU Leuven), campus Kulak in Kortrijk. (See: https://www.kuleuven-kulak.be/posterwall/poster/2017/u0037921/ITEC_posters-Kulak_onderzoeksnamiddag2017-TEL.pdf). ITEC is a research group of KU Leuven and imec and brings together researchers of four disciplines (educational psychology, statistics, applied linguistics, and computer science) to collaborate on research topics in educational technology, such as the instructional design and effectiveness, educational statistics and data mining, and information extraction.

I am responsible for carrying out (quasi-)experimental effectiveness research in technology-enhanced learning environments on the basis of theory-driven and empirically validated instructional design principles. This includes evaluation of the impact of choices in instructional design (e.g. task characteristics, task sequencing, learner support) on human learning by analyzing and triangulating the following data sources: 1) observed behavior as captured by tracking technologies; 2) audiovisual processing; 3) cognitive learning outcomes; and 4) dynamic-affective learning outcomes (e.g. goal orientation, perceived functionality, perceived ease of use).

In the next years I will be, among others, involved in the TECOL (Technology-Enhanced COllaborative Learning) project (see https://www.kuleuven-kulak.be/tecol/) aiming at the design, implementation and evaluation of recent features of educational technology and the subsequent LECTURE+ project focusing on the design and evaluation of a data-driven and evidence-based platform for decision support for teachers, room operators and learners in higher education and corporate training, geared towards improving learner engagement in face-to-face, remote, and recorded lectures. Objectives include modelling and enhancing learner engagement through behavior tracking and audiovisual processing, improving the cost-efficiency and scalability of real-time video direction, and demonstrating the added value of interactive technology-enhanced learning.

"Smart education" to promote engagement and effective learning

Over the last 50 years, computers became more and more present in all areas of human society. Also, the field of education has not escaped from this evolution and an important shift towards increased digitalization has occurred (Laurillard, 2002; Yang, Schneller, & Roche, 2015). Next to this, learning analytics is an emerging and promising field for educational research and technology-enhanced learning processes (Conde & Hernández-García, 2015). The TECOL project can be situated in the shift and started in March 2016 at the University of Leuven, Belgium in collaboration with two industry partners, Barco and Televic. The main objective is to enhance interactivity, collaboration, and flexibility in the learning process of University students. The TECOL approach integrates 1) Barco's weConnect system which provides an easy to use, campus-wide user experience for collaborative learning as multiple screens can be shared simultaneously, with 2) Televic Education's collaborationQ platform (a cloud-based platform that provides interactive and collaborative learning activities). The TECOL platform not only offers opportunities for on-campus learning, but also provides the opportunity for connecting remote classes or individuals in an interactive way, overcoming the limitations of distance to enable remote student-teacher interaction.

At the University of Leuven, campus Kulak - including 6 faculties – some of the learning spaces are redesigned and equipped with the innovating educational technology. This campus functions as a living lab, called Edulab (see Figure 1), in which the TECOL solutions and implementations in authentic learning settings are being evaluated and fine-tuned based on a design-based research approach (Barab & Squire, 2004). During the first phase, the project focused on the interactive lecture and the collaborative learning space. Data are collected through focus group interview with lectures and surveys to get insight on the technology acceptance (Davis, 1989) of both students and teachers and learning analytics with be used to more precisely understand students' learning needs and to support teachers to provide optimal feedback and make well-grounded

educational decisions based on the content of students' interactions and artifacts (Cuendet & Tormey, 2015; Matuk, Linn, & Eylon, 2015)

Figure 1. Different learning settings at Edulab, the living lab of the TECOL-project.

The first results show that the perceived ease of use, the perceived usefulness and the behavioral intention are high regarding the interactive and collaborative features implemented in the living lab and that effective use of the features significantly improve the technology acceptance ($p < 0.001$). For example, regarding screen sharing, students with experience ($N = 121$, $M = 4.52$) are significantly more positive compared to students without experience with screen sharing ($N = 157$; $M = 3.91$).

Yet, based on the first use cases important questions and challenges revealed to be solved in this context. Teachers stress the need for more informed and evidence-based use of technological interventions during interactive lecture and during collaborative learning settings. To meet this need, future research will set up quasi-experimental instructional design studies to compare different didactical-pedagogical scenarios guided by the recent literature on scripting and orchestration (Dillenbourg, 2015; Raes & Schellens, 2016). Next to this, an ongoing systematic review focuses on the definition of engagement toward detecting learner engagement (from behavioral data and audiovisual data as well), for both online and offline learning, for collaborative and individual learning, to inform instructional design and educational decision making as optimization of learning requires not only to retrieve the useful information and knowledge about learning processes and relations among learning agents, but also to transform the data gathered in actionable information.

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