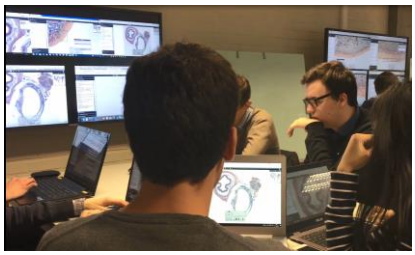
Students' perceptions towards the use of Technology-Enhanced Collaborative Learning (TECOL) in higher education

Abstract: This poster will present students' perceptions towards the use of interactive quizzes and polls during lectures and the screen sharing functionality during collaborative learning within the context of the campus-wide TECOL-project. Results reveal that students positively evaluate this innovative technology and it has been found that experience with the technology even improve students' technology acceptance which counter a novelty effect.

The TECOL-project to enhance interactivity, collaboration and flexibility

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). The TECOL project can be situated in this shift and started in March 2016 at the University [institution and location omitted for blind review] in collaboration with two industry partners [names omitted for blind review]. The main objective is to enhance *interactivity, collaboration, and flexibility* in the learning process of University students. At the University [blinded] some of the learning spaces are redesigned and equipped with innovating educational technology. The redesigned learning spaces function as a living lab, called Edulab which are partly displayed in Figure 1.

Interactive lecture with quizzes & polls



Collaborative learning space with screen sharing functionality

Multi-location learning: remote classroom

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

Edulab facilitates in general three different learning settings, i.e. the interactive lecture, collaboration learning spaces and multilocation learning. During the interactive lectures quizzes and polls can be launched through the TECOL platform to increase interactivity and formative assessment during lectures. The collaborative learning spaces are characterized by flexible work stations with bidirectional screen sharing between students and teachers. 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.

Research questions and methodology

The TECOL solutions and implementations in authentic learning settings are evaluated and fine-tuned based on a design-based research (DBR) approach (Barab & Squire, 2004). A crucial first phase within DBR is to explore and analyze the perceptions of all stakeholders. This study focuses on the students who have experienced the TECOL solutions for interactive lectures and/or the screen sharing during collaborative learning. This study investigates students' perceptions based on the Technology-Acceptance-Model (TAM) (Davis, 1989). This model includes the *perceived ease of use* (PEU), *the perceived usefulness* (PU), the *attitudes* (ATT) towards using the specific technology, and the *behavioral intention* (BI) to use the technology in future learning. This TAM has been used and validated in several previous studies (e.g. Lust, Elen, & Clarebout, 2012).

Three questions were put forth within this study: 1) What are students' initial expectations about the TECOL features? 2) How do these perceptions evolve after one semester in which students have used the TECOL features? And 3) What is the predictive value of the different factors of the TAM?

All students on campus (N = 1349) have been invited twice to fill in the survey, yet, as this study questions possible fluctuations in technology acceptance after user experience, only students who completed both surveys (N = 113) and had experience with the TECOL features were included. 60 students where users of the interactive lecture through quizzes, 49 students had experienced the collaborative learning through screen sharing. By June, we will also have students' evaluations of the multilocation learning setting.

Results and conclusion:

Table 1 summarizes the mean values of students' perceptions regarding the technology acceptance. First, based on one sample t-tests, we found that all means differed significantly from the neutral score (3.5) which indicates a positive evaluation of both TECOL features. Second, paired sample t-tests were conducted to investigate whether these positive perceptions remain, increase or decrease over time while using the technology. Most factors did not significantly change meaning that the there is no increase or relapse in the positive evaluations due to for example a novelty effect. However, regarding three factors, we found a (marginal) significant effect indicating an increase in the behavioral intention to make use of interactive quizzes, and an increase in the perceived ease of use and the perceived usefulness of screen sharing. This means that more experience has a positive effect on students' technology acceptance.

Table 1: Students' mean values and significant effects based on paired samples t-tests

	Interactive quizzes (*N*=60)		Sign. level	Screen sharing (*N*=49)		Sign. level
	M (SD) T1: Dec. survey	*M (SD)* T2: June survey		Mean (SD) T1: Dec. survey	Mean (SD) T2: June survey	
PU	4.54 (.71)	4.41 (.72)	p = .16	4.42 (.94)	4.66 (.66)	p =.065 ↑
PEU	4.36 (.85)	4.42 (.64)	p = .57	4.56 (.95)	4.84 (.64)	p =.056 ↑
ATT	4.74 (.82)	4.85 (.78)	p = .25	4.78 (.94)	4.72 (.79)	p =.65
BI	4.43 (1.03)	4.85 (1.05)	p < .005 ↑	4.76 (.95)	4.78 (1.01)	*P=.88*

Note. PU = Perceived usefulness, PEU = Perceived Ease of Use, ATT = attitudes towards use, BI = behavioral intention.

The results from the (multiple) regression analysis - displayed in Figure 2 - confirm the relationships among the variables which have been found in previous research (Davis, 1989; Lust et al., 2012). PU is positively affected by PEU. Subsequently, both factors positively influence the attitudes towards the specific technology, which in turn also influence the continued usage intention (BI).

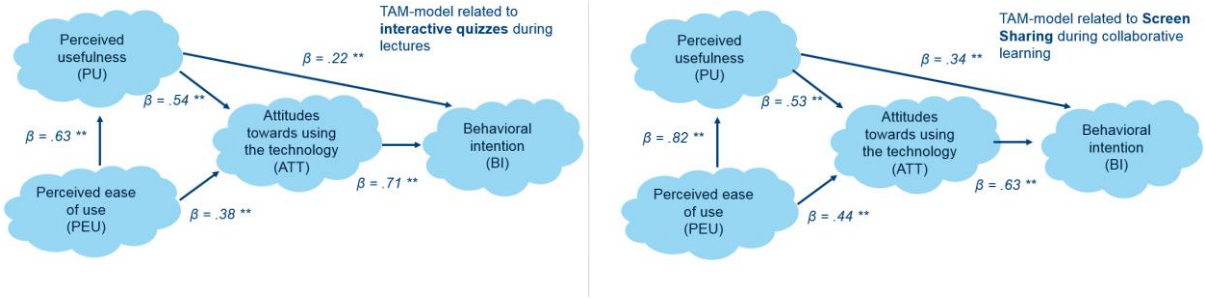


Figure 2. The TAM models related to interactive quizzes and screen sharing

These results are only a first, but crucial, step in the design and implementation of future teaching and learning which meets the requirements of the digital age. We hope that we can share our experiences with other educational institutions to achieve educational change through the synergistic development of a new pedagogy, together with the development of the physical learning space and the material conditions.

References

Barab, S. & Squire, K. (2004). Design-Based Research: Putting a Stake in the Ground. *The Journal of the Learning Sciences.* 13 (1), 1-14.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319-340.

Laurillard, D. (2002). *Rethinking University Teaching. A conversational framework for the effective use of learning technologies.* London: Routledge

Lust, G., Elen, J., & Clarebout, G. (2012). Adopting webcasts over time: The influence of perceptions and attitudes. *Journal of Computing in Higher Education*, *24*(1), 40–57.

Yang, J., Schneller, C., & Roche, S. (2015). The role of higher education in promoting lifelong learning. *UIL Publication Series on Lifelong Learning Policies and Strategies: No. 3.*