It's a Matter of Quality!
Boundary Conditions for Effective Technology-Enhanced Learning and Teaching

Technology has been enthusiastically embraced as a tool to advance learning and teaching in schools. However, empirical findings on its effectiveness in promoting student achievement are mixed, indicating that the benefits of learning with technology are not as straightforward as expected. In this talk, I will illustrate that it is not the quantity of technology use that matters; rather, the impact of technology on learning depends on how it is integrated into the classroom and how it enhances the quality of instruction. According to technology integration models, technology is most effective when it transforms traditional teaching methods by enabling new functionalities or addressing new learning objectives. I will demonstrate this with data from a randomized controlled field trial on the use of simulations for guided inquiry learning in Physics education.

Furthermore, technology-enhanced instruction should ideally increase students' cognitive engagement with the content (i.e., their cognitive activation) and provide personalized support to help them overcome knowledge gaps (i.e., constructive support). Supporting this assumption, findings from a large-scale tablet initiative show that students in classes equipped with tablets ($k = 56$ classes) reported experiencing higher levels of constructive support than those in non-tablet classes. Additionally, cognitive activation served as a mediator, explaining the effects of technology use on learning engagement. Overall, these findings suggest that teachers play a pivotal role as they are responsible for integrating technology into the classroom and designing high-quality instruction. Consequently, the final part of the keynote will address the competencies teachers need to effectively teach with technology and how they can acquire these competencies through professional development.

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