

## Leveraging Technologies to Enhance Education Systems: Insights from Large-Scale Studies in K-12 and University Settings

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Monday, April 1, 2019  
12:00 – 1:15 pm, Education 2010

**Abstract:** Digital technologies are being rapidly adapted in both secondary and postsecondary settings, with insufficient analysis as to their impact on teaching and learning processes and outcomes. This talk presents studies that use large-scale analysis of digital data to illuminate these impacts in two contexts: (a) science teacher learning through online professional development and (b) student learning in online college courses. In teacher education, a nationwide data set (200,000+ students, 10,000+ teachers) is analyzed to examine teachers' preparation in response to the Advanced Placement science curriculum reform. Notably, participation in a discussion board-based online teacher community is shown to relate to higher student performance. Similarly, analysis of social media discourse in purposefully selected Twitter communities indicates that collaborative microblogging communities adhere to design characteristics of high-quality professional development activities and can thus complement traditional professional learning activities. In higher education, a longitudinal institutional data set (4,500,000+ course enrollments, 100,000+ students, 10 years) is analyzed to examine undergraduate success. The study confirms prior research showing that students in online courses perform worse than students in face-to-face courses. However, the study contrasts from prior research in several important ways. First, it finds that the actual grade penalty is quite small—about 0.1 grade points per course. Second, it finds that students typically at risk suffered no additional grade penalty in online courses; in fact, students with weaker academic preparation have a smaller grade penalty than their better prepared counterparts. Third, the study reveals that, for all students, the number of online course enrollments is associated with increased graduation rates and slightly shorter time-to-degree. Overall, these studies indicate the potential benefits of digital learning but also highlight the need to improve technology design and implementation to advance education.



**Bio:** Christian Fischer is a distinguished postdoctoral scholar at the Digital Learning Lab and the Teaching & Learning Research Center at the University of California, Irvine. He received his Ph.D. in Learning Technologies from the School of Education at the University of Michigan. His dissertation was recognized with the Robert Schuck Distinguished Dissertation in Teacher Education Award from the Association of Teacher Educators. Dr. Fischer's research interests are situated at the intersections of educational technologies, science teacher education, and higher education. In his interdisciplinary research projects, he empirically examines pathways to improve educational effectiveness. His research employs a broad array of research methodologies ranging from traditional inferential statistics to educational data mining, social network analysis, and clickstream data methods to examine how new technologies can transform teaching and learning.