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Editorial: New Technologies for Teacher Professional Learning

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During the last three decades a massive amount of resources has been expended to create universal access to technology in schools. The underlying assumption fueling these investments is that use of technology will transform teaching and learning. Yet, researchers have consistently observed modest use of technology in most schools and classrooms.

Larry Cuban, has articulated these problems in his seminal books *Teachers and Machines* (1986) and *Oversold & Underused: Computers in the Classroom* (2001). He noted that all new technologies go through the same cycle: popular interest and reformers' enthusiasm, limited implementation in the classroom, a public shaming of teachers who failed to realize the promise, and a subsequent move to new tools.

Recent data from the Jefferson Education Exchange continue to indicate limited implementation of technology by teachers. Specifically, although $13.2 billion is spent annually on educational technology, 65% of it remains unused, 30% is underused, and only 5% is properly used (jexuva.org/). Further, research indicates variability in the ways teachers utilize technology, with some focusing on practices that provide opportunities similar to paper and pencil or earlier forms of technology and others capitalizing on the unique features of new and emerging technologies (see Jahnke & Kumar, 2014; Mouza & Barrett-Greenly, 2015; Reichert & Mouza, 2108).

Part of the challenge in realizing the potential of technology is teacher preparation, professional development, and follow-up support. To be transformative, teachers need to have the knowledge – frequently referred to as technological pedagogical content knowledge (Mishra & Koehler, 2006) – needed to take full advantage of technology within disciplinary instruction.

The articles in this issue focus on two broad themes that address teacher learning and professional development: (a) pedagogical approaches and tools that help pre-service and in-service teachers develop the knowledge needed to deliver high-quality, technology-rich instruction (see Hughes; Kormos; McCulloch, Lovett, & Edgington); and (b) the role of technology in delivering innovative professional development experiences for teachers (Melton, Miller & Brobst; Slagoski).

The CITE - General section article, *Learning Across Boundaries: Educator and Startup Involvement in the Educational Technology Ecosystem* by Joan Hughes, presents a fresh perspective on ways current and future teachers can learn about technology from entrepreneurs and designers of educational technology products. Data were collected through interviews with educational technology startup founders, preservice, and in-service teachers in the context of an educational technology design summit, called SlowPitch. Findings indicated benefits for both teachers and designers. Specifically, teachers learned about educational technology innovations, engaged in design thinking for integrating those innovations in their current or future classrooms, and became aware of different influences within the broader educational technology ecosystem. Startup founders learned how their products would work or not work in authentic classrooms, explored ways of capturing the K-12 market, and identified strategies of attracting potential users. This study has implications for the design of new educational technology products that make their way into the classroom.

The CITE - Social Studies Education article, *An Examination of Social Studies Educators to Facilitate Preservice Teacher Development of Technology Integration* by Erik Kormos, examines the current practices of social studies education in the use of technology. Using survey data, the study examined teacher adoption of technology, sources of acquired skills, usage frequencies, perceived effectiveness, and barriers to integration. The survey was distributed to 398 social studies teachers in grades 6-12. Similar to prior studies, the authors found that teachers utilized primarily productivity tools through the Google suite, including docs, sheets, and slides, as well as the Internet. Participants perceived these tools to be effective. The majority of the participants reported acquiring new skills through trial and error. Discussing barriers to technology integration, participants noted cost, student knowledge of technology, and time for planning. Findings of the study have implications for teacher educators. As the authors indicated, "by better understanding technology usage in the field, educators may begin to address gaps within teacher education programs and current practice."

The CITE - Science Education article, *Mentoring the Mentors: Hybridizing Professional Development to Support Cooperating Teachers' Mentoring Practice in Science* by Josie Melton, Matthew Miller, and Joseph Brobst, examines the role of a hybrid professional development as a means of supporting practicing educators who serve as mentors to prospective teachers. The authors describe key features of the professional development program, which combined in person immersion into the components of effective science instruction in conjunction with online modules centered on mentoring practices for cooperating teachers. Data were collected from five participating teachers who were new to professional development. Data included recorded mentoring conversations before and after participation in hybrid professional development. Findings indicated that professional development helped cooperating teachers more effectively coach preservice teachers. Specifically, following their participation in professional development cooperating teachers were more likely to focus on evidence of students' science learning and to draw on a consistent framework for effective science instruction for their conversations. Findings of the study have implications for the design of new forms of professional development that adopt new delivery methods and technologies.

The CITE - Current Practice article, *Professional Learning Practices and Beliefs of an Online Community of English Languages Teachers* by Jeremy Slagoski, investigated the role of social media such as Twitter in helping teachers form a professional learning network that supported their professional growth. Data were collected from 20 teachers from around the world, who were members of the author's professional learning network in Twitter. These data included interviews, blog posts, and tweets. Findings illustrated that compared to other forms of professional learning, such as textbooks, scholarly articles, and

conferences, participants valued social media due to their accessibility, brevity, and low cost. Similar to the CITE-Science study, this work has implications for the design of new forms of professional development that take advantage of new technologies such as Twitter.

The CITE - Math Education article, *Designing to Provoke Disorienting Dilemmas: Transforming Preservice Teachers' Understanding of Function Using a Vending Machine Applet* by Allison McCulloch, Jennifer Lovett, and Cyndi Edgington, presents on the role of new technologies such as applets to support understanding of preservice teachers on the function concept. According to the authors, functions are considered important in high school mathematics due to their foundational role in college-level mathematics and related science topics. The authors discuss the design of an applet in the form of a vending machine, which helps preservice teachers purposefully problematize common misconceptions associated with the algebraic nature of typical function. Data were collected from nine preservice teachers enrolled in a university course prior to student teaching. Specifically, participants were asked to provide written definitions of functions with accompanied examples before and after completing tasks with the vending machine applet. Findings indicated that interaction with the applet facilitated participants' understanding of functions – specifically, preservice teachers for whom the applet provoked a dilemma were able to elaborate on or transform their understandings related to the definition of function. Results have implications for pedagogical practices that help disrupt preservice teachers' knowledge of mathematics.

We hope readers enjoy this set of articles. *CITE Journal* editors look forward to seeing you at the SITE Conference in Las Vegas from March 18-22.

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