

Editorial: Virtual Learning Environments as Contexts of Innovation in Teaching and Learning

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As we enter another academic year marked by the uncertainty of COVID-19, a number of pressing issues are looming large for K-12 education, including the impact of the pandemic on students' academic achievement. Just recently, the National Center for Education Statistics (NCES, 2022) released results from a special administration of the NAEP long-term trend reading and mathematics assessment for 9-year-old students to examine achievement during the pandemic. Results indicated declines in both reading and mathematics — average scores declined 5 points in reading and 7 points in mathematics compared to 2020.

According to the report, the decline is not only significant but the largest average score decline in reading since 1990 and the first ever score decline in mathematics (NAEP, 2022). What is more concerning are the distinct inequities documented by NAEP. Results indicated that among those students who scored at or below the 25th percentile, only 58% said they had access to a desktop, laptop, or tablet during remote learning, compared to 83% of those students who scored at or above the 75th percentile. Further, only 26% of students who scored at or below the 25th percentile said they had their teacher available to help with schoolwork every day or almost every day, compared to 45% of students who scored at or above the 75th percentile. These results indicate the importance of technology during these trying times but also the critical role of teachers who can help students in their learning.

As we move forward, educators will be a driving force in efforts to help this generation of students avoid long-term detrimental consequences associated with the pandemic while focusing on issues of equity in teaching and teacher education. To accomplish this goal, we need to develop a new vision for teacher education that leverages lessons learned to reimagine the role of virtual teaching and learning, as well as the role of innovation, agency, and entrepreneurship among the teaching force (Mouza et al., 2022).

The articles in this issue address these topics head on by examining how teacher candidates can adapt and improvise their practice in the context of virtual field work as well as become agents of change as innovators and entrepreneurs. Other articles examine the role of technology and technology-based learning environments in supporting teacher learning in science, technology, engineering, and mathematics (STEM) fields, specifically in relation to teaching efficacy beliefs.

The CITE-English Language Arts Education article, "[Teacher Candidates' Pivot to Virtual Literacy Field Experiences: The Interplay of Culturally Responsive Sustaining Pedagogies and Improvisation](#)," examines how teacher candidates enrolled in literacy courses utilized the affordances of virtual field work to learn about their students' interests, cultures, and experiences. In turn, they were able to utilize their new learning to improvise their practice and implement culturally responsive literacy instruction. Consistent with prior research (see Garcia & Seglem, 2018; Schieble & Polleck, 2021), this work points to the affordances of virtual field experiences to shift attention directly on students in ways that helped build relationships, disrupt power dynamics among teachers and students, and center culturally responsive pedagogical practices. As we consider lessons learned from virtual field experiences implemented by necessity during the pandemic, we should carefully continue to examine the affordances and constraints of these practices and the way they can be orchestrated to complement in-person experiences allowing teacher candidates to innovate, disrupt established practices, and elevate students' unique cultural backgrounds and identities.

Following on the theme of innovation, the CITE General section article, "[Critical Innovators: How Teachers and Entrepreneurs Position Themselves as Technology Innovators in Schools](#)," analyzes how teachers, entrepreneurs, and teachers-turned-entrepreneurs position themselves in terms of guiding interests, approaches to change, and orientations to power and the traditional status quo. In this work, the authors begin to reimagine the role of teachers and entrepreneurs when innovating with new technologies and offer implications for teacher education that supports innovational authority and a vision for school change.

The remaining three articles focus on mathematics and science teachers' learning and knowledge development. CITE-Mathematics Education, "[Using a Framework to Develop Preservice Teacher Noticing of Students' Mathematical Thinking Within Technology-Mediated Learning](#)," examines the development of secondary preservice mathematics teachers' noticing in the context of technology-mediated environments. Building on

a framework focusing on students' mathematical thinking in technology-mediated learning environments, the authors examined pre- and post-video-based assessments to identify changes in participants' noticing as a result of engaging with the framework. The authors discuss the complexities involved in noticing students' mathematical thinking, particularly coordinating written or spoken responses and technology engagement, and provide recommendations for teacher educators.

With an explicit focus also on teacher learning, "[Impacts of Microcredentials on Teachers' Understanding of Instructional Practices in Elementary Mathematics](#)" examines the role of online microcredentials for both expanding access to professional development among rural teachers and increasing knowledge of evidence-based instructional practices in mathematics. While online professional development is not a new concept (Dede, 2006), microcredentials have more recently emerged as a promising approach to building high-quality, flexible, and personalized experiences for teachers (Burke et al., 2022; Rasberry et al., 2022).

Finally, the CITE-Science Education article, "[Effect of a Science-Based TPACK Program for Elementary Preservice Teachers According to Their Gender](#)," examines the impact of a teacher education program built around the framework of technology, pedagogy, and content knowledge (TPACK) on participants attitudes, TPACK, and self-efficacy beliefs. Findings indicated the potential of teacher education programs built around sound theoretical frameworks to support teacher learning as well as mitigate gender differences around teaching efficacy that integrates science and technology.

Collectively, these articles point to the need of rethinking pedagogy and opportunities for practice within teacher education in ways that prepare teachers for in-person, online, and blended modalities (Hodges et al., 2022). Toward this end, technology offers tremendous opportunities to help educators leverage emerging tools to create spaces that facilitate teacher learning, practice, and teaching efficacy. We hope our readers enjoy this set of articles and hope to see many readers virtually at SITE Interactive.

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