

Looking Back in Order to Move Forward: Lessons from COVID-19 for Teacher Education

Excelsior: Leadership in Teaching and Learning
2023, Vol. 16(1), 40-49
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surface.syr.edu/excelsior
<https://doi.org/10.14305/jn.19440413.2023.16.1.03>

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Abstract

This article provides critical perspectives on education technology integration in a teacher education context in a post-pandemic world. The authors—two early career teachers, one in a pre-school and one in an elementary school, and two elementary teacher education faculty members at a mid-sized public university—use the U.S. Department of Education’s 2016 guiding principles for educational technology in teacher education for analysis. The commentary evolves directly from and reflects the authors’ collective experience across the P-20 spectrum in education technology, with close attention paid to what was learned during the onset of the COVID-19 pandemic and subsequent pivot to remote learning in spring 2020, which altered the teacher education landscape in significant ways. This article makes curricular and pedagogical suggestions for P-20 educators and concludes with recommendations for future research at the intersection of technology integration and teacher education.

Keywords

teacher education, technology integration, education technology, technology infusion

As P-20 schools, colleges, and universities worldwide responded to the COVID-19 crisis in early 2020, and students and teachers turned to remote instruction as a possible solution, we quickly learned that P-20 educators’ abilities to teach online vary greatly. Although the full story is complex and nuanced, this paper makes the argument that some schools and colleges of education (including our own) have more work to do when it comes to infusing teacher education curriculum and pedagogy with technology theory and practice. Indeed, despite a marked uptick in the number of technology tools and

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platforms present in classrooms, and a growing body of scholarship that recommends technology infusion in teacher education (see Foulger et al., 2019; Borthwick et al., 2022), the project of educating future educators has often lacked crucial, necessary supports for teacher candidates' learning (see Kolb, et al., 2018). The pandemic laid bare the need for additional support, resources, and research in this area.

The authors of this paper share a preliminary analysis for what we learned about education technology in 2020, and what we believe needs to change in teacher education in an instructional technology context in the immediate future. First, we briefly review relevant literature; then, we offer an analysis of lessons learned based on our collectively lived experience as educators in the field during a global shift to remote learning due to COVID-19; and finally, we conclude with recommendations for further practice and research. To remain consistent with policies and guidelines from the teacher education field, we align our analysis with the U.S. Department of Education's four guiding principles for educational technology in teacher education.

The DOE's Four Principles for Education Technology, and Implications for Teacher Education

Although multiple factors are at play, teacher education programs undoubtedly provide a "gateway to the larger community of practice" of teaching in a technological context (Ebersole, 2019, p. 125). In other words, the methods, theories, and frameworks that teachers employ in the classroom often reflect what they were taught as teacher candidates (Oleson & Hora, 2013). In the absence of a fully-funded federal effort to infuse technology in teacher education, preservice teacher candidates' exposure to technology pedagogy, theory, and practice varies greatly by institution and program, and is solely dependent in many cases on individual faculty's level of skill and knowledge (Kolb et al., 2018). In response to the patchwork quilt of technology teaching and learning that emerged in the preceding decade, the U.S. Department of Education's Office of Educational Technology created four guiding principles for teacher education programs in 2016: 1) active use of technology, 2) sustainable professional learning for faculty, 3) program-deep and -wide educational technology experiences for teacher candidates, and 4) research-based methodologies (U.S. Department of Education, 2016). Our observations and recommendations are organized around these four principles. For clarity and organization, we have framed our discussion about each principle around the following questions: 1) What happened?, 2) Why did it happen?, and 3) How should this inform current practice?

Active Use of Technology

In order to be effective instructional technologists when hired as lead teachers, teacher candidates should be immersed in technology theory, methods, and tools during the teacher education process (Greene, 2018; Dillon et al., 2019). While many current teacher candidates and newly hired teachers were born into the age of the internet and possess a seemingly natural affinity for and familiarity with digital devices and online communication—especially social media—exposure alone "does not guarantee that they have developed sophisticated digital skills in general" (König et al., 2020, p. 618), or that they can teach with technology (Engen et al., 2014, p. 2104; Koehler & Mishra, 2009). While our teacher candidates have deep familiarity with technology designed for shopping and entertainment, they lack exposure and experience with technology for teaching and learning. Therefore, teacher education

course content must extend beyond traditional instruction and “provide pre-service teachers opportunities to use technology in ways that allow for active engagement” (U.S. Department of Education, 2016, p. 10). In the same way we would never ask young students to use math manipulatives to solve a math problem before they’ve had a chance to explore the manipulatives, we should never ask teachers or teacher candidates to use technology to teach without ever having had the chance to actively try out the tools first.

Because we cannot predict the platforms, tools, or devices teacher candidates will be expected to use when eventually hired as teachers, teacher education programs should provide candidates with a multiplicity of experiences that offer the opportunity to establish, expand, and transfer digital literacy knowledge across platforms, tools, and devices (Greene, 2018). Without access to tools, and what Kolb (2017) calls “dynamically focused on the learning goals and not just busy doing what looks like learning” (p. 12), teacher candidates may not be sufficiently prepared to teach in an online environment, which we observed in spring 2020 during the widespread pivot to remote instruction due to COVID-19. While curriculum and pedagogy are the most important pillars of any teacher education program, without significant additional tools and supports, neither is sufficient for teaching teachers how to teach with technology.

What Happened? Due to the national shift in instructional modality that began in March 2020, many students and educators across the P-20 educational system experienced a sudden switch from in-person to remote learning. Teachers quickly searched for ways to put their existing material online—many without the sufficient training to do so, as each of us witnessed first-hand in our respective, current areas of work, which include a daycare center, an elementary school, and a university. As many educators at every level of learning struggled to move instruction online, they found that they not only had to redevelop the content, but that they also had to rethink their pedagogical approach. Indeed, the meaning of Technology Pedagogy and Content Knowledge (or TPACK, the now-well-known framework for understanding the relationship between technology, pedagogy, and content knowledge in an educational context) (Koehler & Mishra, 2009) became crystal clear overnight out of necessity.

In a seated classroom, for example, teachers often rely on small-group work to scaffold, reinforce, and reteach new skills and concepts. But in an online environment, the power of small group instruction does not readily translate, especially with young children. In person, the teacher can observe several small groups at a time; online, being able to observe small-group work is possible but requires knowledge of breakout group functionalities and additional logistical planning. In any modality, the teacher’s role is to redirect students and ensure equitable work among group members; in an online environment, this is not always feasible. In our collective experience, it is easier for small groups to fail in a virtual environment because of a lack of supervision or predictable logistics—especially in the younger grades. Further, small group work online often relies on the remainder of the class participating in some form of asynchronous learning activities, a modality that few young children or teachers truly understood before COVID. Similarly, other approaches typically used by elementary teachers, such as Think-Pair-Share or peer teaching, do not translate intuitively to remote instruction. Overwhelmingly, we observed that the move to online teaching was varied, disconnected, and inconsistent across the P-20 spectrum.

Why Did This Happen? In the absence of ongoing, consistent opportunities to actively learn new technology in both theory and practice, many teachers, teacher candidates, and teacher education faculty have fallen short of learning to confidently teach online.

How Should This Inform Current Practice? Teacher education programs need to incorporate numerous practices that will provide teacher candidates with opportunities to actively use technology (Borthwick et al., 2022). For example, teacher education coursework might include the building and maintenance of simple web pages (e.g., Google Sites, WordPress); and designing and building online courses, assignments, and assessments in learning management systems (e.g., Moodle, Google Classroom, Canvas). Further, principles for effective remote instruction should be emphasized, such as organizing information in one place so that students always have a home base for all resources, communication streams, and progress monitoring. Teacher educators must make sure candidates understand fundamental principles of effective online instruction so that they can apply these principles to any online platform they encounter as they become classroom teachers.

Both synchronous and asynchronous instruction should engage and motivate the learner. Therefore, teacher education coursework, too, needs to move beyond the traditional read-and-respond or sit-and-get format (Borthwick et al., 2022). In order to model how to reteach and reinforce pertinent information, teacher educators need to provide teacher candidates with opportunities to not only plan, but also implement, a variety of teaching and learning experiences online. Importantly, teacher educators must also examine the assumptions about available materials they bring to the classroom. The expectation that all teacher candidates have access to a late-model laptop and high-speed internet is not reasonable in many settings or for many students. For teacher candidates to get experience with online teaching platforms, they need access to hardware, and some students will require assistance from their institutions. This model for teacher education would necessitate additional funding, as well as more robust and ongoing professional learning experiences for teacher education faculty.

Sustainable Professional Learning for Faculty

Teaching faculty are one of the most important determinants of success in any teacher education classroom. Given the rapid rate of technological change in our current society, educators who educate educators require “ongoing, job-embedded opportunities” to expand and extend their understanding at the intersection of technology, teaching, and learning (U.S. Department of Education, 2016, p. 11). Such opportunities need to be on-demand and *à la carte*—or as needed, and as much or as little as necessary (Greene, 2020). For instance, what if schools and colleges of education offered choice-based menus for professional learning and approached it like differentiated instruction for faculty instead of the more typical one-size-fits-all approach? Without these meaningful, relevant, and immediately-applicable opportunities to engage and understand, instructors risk causing digital whiplash—cognitive saturation and resulting dissonance from being expected to learn and then apply too much in too little time (Greene, 2018, p. 11).

In these austere times, teacher education faculty do not possess the necessary time, resources, or supports to learn everything there is to know about instructional technology (Kolb et al., 2018; Dillon et al., 2019); however, without ongoing opportunities to learn and implement that new learning, teacher education faculty will be unable to effectively educate future teacher candidates for an increasingly digitized and AI-powered world. In the words of Borthwick and Hansen (2017), “we need to work together as schools, colleges, departments of education, and leaders in professional associations” (p. 47). It is imperative that we create and make accessible sufficient space for teachers, teacher candidates, and teacher education faculty to simultaneously renew their knowledge in time with changing policies, practices, and perspectives (Patterson et al., 1999; Darling-Hammon & Bransford, 2007). A major

lesson of 2020 is that teacher education faculty require additional professional learning supports in an instructional technology context.

What Happened? When the COVID pandemic hit, teacher educators were poised to consider new and different learning modalities in ways other higher education instructors were not, because they teach about pedagogy every day. However, the historical resistance to technology integration in teacher education (Kolb et al., 2018) showed up in the post-COVID teacher education learning landscape when we observed that some teacher educators struggled to move content to, in most cases, a fully online environment.

Why Did This Happen? We can only speak from our collective experiences and perceptions here, and we believe that professional learning for technology infusion in teacher education was not prioritized before the COVID pandemic largely due to funding, faculty buy-in, and the rapid pace of change (Greene, 2018; Kolb et al., 2018). At our institution, these elements hold true as the biggest obstacles pre-2020; however, we now believe that the biggest obstacles to securing professional learning for faculty have shifted slightly to include funding, time, and evidence of effective online education for teacher education. Online learning during the pandemic demonstrated the promise and possibilities—and limitations—of online teacher education, but more research is needed, particularly on the efficacy of online clinical practice.

How Should This Inform Current Practice? The most important lesson here is that professional learning in teacher education for technology must be ongoing, practical, and tailored to the needs of the learners, whether they are teachers, teacher candidates, or teacher education faculty (Greene, 2020). Colleges and schools of education need to prepare both short- and long-term plans for not only developing the professional knowledge and practices of their faculty and pre- and in-service students, but also for maintaining that knowledge and practice as the field continues to shift rapidly (Greene, 2020). These efforts will require institutions to commit to this effort with time and money—and included in these efforts must be an ongoing commitment to equity in education. Differentiated professional development must include understandings of students' lived experiences, particularly when those experiences differ from instructor experiences.

Program-Deep and Program-Wide Teaching & Learning

As the spring of 2020 made abundantly clear, scholars calling to explicitly infuse—not just integrate—technology into *all* aspects of teacher education (see Foulger et al., 2019) had, prior to the onset of the pandemic, raised the alarm that educators are underprepared to teach online most effectively. Researchers now believe that for technology learning to be effective for teacher candidates, it must be infused throughout a teacher education program, rather than being compartmentalized in one class or workshop (see for example Borthwick et al., 2022). When teacher education faculty connect programmatic learning experiences and content through technology, they leave the necessary digital breadcrumbs to which teacher candidates can attach new instructional technology knowledge and skills (Borthwick et al., 2022). There remains no standardized approach to technology integration or infusion across schools and colleges of education: some teacher education programs do not have any coursework dedicated to technology, while others have one technology course, and still others have infused their

curriculum with technology in multiple ways (Borthwick et al., 2022).

What Happened? During COVID, the inconsistency of the approach to technology in teacher education revealed itself in widely varied skill sets among educators at all levels of teaching and learning across the P-20 educational ecosystem. Teachers, teacher candidates, and teacher education faculty alike scrambled to make sense of a fully online environment—in large part because 1) they were not necessarily taught how to teach online, and 2) they never learned in a fully online educational environment. Rather than being program-deep and program-wide, the approach to technology in teacher education on the whole has been arguably shallow and narrow. During COVID, the widespread shutdown further limited candidates' ability to access authentic learning experiences, especially as access to classrooms for fieldwork and student teaching diminished significantly.

Why Did This Happen? Numerous factors contribute to how any given teacher education program handles curricular changes, and in New York State, shifting regulations and policies, often driven by certification requirements, determine most. The pandemic and resulting pivot to remote instruction caused widespread concern about the quality and purpose of teacher education delivered entirely online.

How Should This Inform Current Practice? In order to sufficiently prepare teacher candidates to teach in an online environment, they need an opportunity to plan learning experiences from start to finish for diverse groups of students. All candidates need to learn how to design and build out learning management systems and develop systems of information management, which necessitate opportunities to practice teaching P-12 students in the field both synchronously and asynchronously. Further, teacher candidates would benefit from discussing, designing, and implementing consistent systems of classroom communication, which often provide the primary course infrastructure for educators and students in an online environment. Lastly, candidates require abundant practice with creating schedules, embedding links, and making resources available at students' fingertips.

In addition to needing more time on task for design and implementation of communication and information management, candidates need abundant opportunities to actively engage in discourse and applied learning related to accessibility, equity, and inclusivity—from both an access-to-technology perspective (as in, do all students have access to devices and broadband?), as well as from the perspective of schools as microcosms of our world that serve culturally, ethnically, linguistically, and gender-diverse students and students with disabilities in an online environment.

Although every teacher education program includes coursework that addresses working with culturally and linguistically diverse students and students with disabilities, much of the content focuses on laws, policies, theories, or history, and does not always touch on practical applications of those ideas in the classroom. For instance, how do teacher candidates learn to offer digital accommodations? How do they apply universal design learning theory in an online environment? How do they actively approach teaching as a culturally responsive-sustaining teacher online? How do they prevent the transfer or replication of oppressive systems and practices through instructional technology? How do they, ultimately, make sure that every student is getting what they need in a digital teaching and learning environment? As we have experienced, providing instruction in a remote setting is not effective for all students when the curriculum and pedagogy are transferred online without these and other considerations. For candidates to be able to respond to these challenges, their instructors must lead the

way. For that effort to unfold across programs, every instructor, from adjunct to full professor, must have online teaching expertise to share with candidates.

Research-Based Methodologies

All of the above suggestions are well-intended and invaluable for any 21st century educator, but unless they are firmly grounded in research-based, theoretical frames, we cannot ensure “a common language to articulate expectations around effective use of technology” in the classroom (U.S. Department of Education, 2016, p. 15). In the authors’ work together through an education technology professional learning program in the SUNY New Paltz School of Education between 2018 and 2019, we paid particular attention to TPACK (Koehler & Mishra, 2009), the Substitution Augmentation Modification Redefinition framework (SAMR) (Puentedora, 2015), the International Society for Technology Education (ISTE) Standards for Educators and Students, the Teacher Educator Technology Competencies (TETCs) (Foulger et al., 2017), and the Triple E framework (Kolb, 2017). These frameworks were chosen for their prominence in technology integration efforts in both P-12 and teacher education. We also spent significant time thinking out loud about and exploring the complexities of privacy, data collection, and surveillance, and we feel it is *because* of these conversations—and those related to the above theoretical frameworks—that our collective experience of transitioning to remote teaching and learning during COVID-19 was relatively smooth (Greene, 2020).

Had all teacher candidates—and faculty—engaged in an education technology professional learning program, or had they been consistently exposed to similar content in their training, we argue that they would have felt more comfortable planning, assessing, and teaching in a remote learning environment. Theoretical and conceptual frameworks that are rooted in research provide grounding for understanding both the *why* and the *what* of teaching in these remote learning times, and they must be embedded in teacher education programs if we hope to move the needle on technology integration and infusion in education.

What Happened? In 2020, the historical disconnect between educational foundations coursework and that of teaching methods courses in many teacher education programs prevented candidates from more explicitly marrying theory and practice in real time. During the COVID-19 shift to remote teaching and learning, we observed that instruction often became fractured, disconnected, and inconsistent, depending on context. Teachers, teacher candidates, and teacher education faculty who lacked the connection to or understanding of various education technology frameworks, such as TPACK, Triple E, SAMR, or the ISTE Standards for Educators, lacked the theoretical anchor provided therein. For instance, when we needed to pivot from in-person, hands-on experiences to an online environment, our collective knowledge of the above frameworks guided our decisions around how to alter interactive experiences to optimize student learning. We were able to make effective, time-sensitive decisions around design, collaboration, and communication especially in order to provide an experience online that approximated that of a synchronous, in-person learning experience.

Why Did This Happen? Although theoretical frameworks are widely cited and utilized by P-12 practitioners, teacher education programs have been slow to incorporate them in methods and field-based coursework.

How Should This Inform Current Practice? We recommend a stronger emphasis on connecting theory to practice in all aspects of teacher education. Teacher candidates should be gaining first-hand experience, from the higher education classroom to the field, on how to engage and instruct students in an online environment. In many ways, theoretical frames are the glue that hold teaching methods together, and without them, teaching and learning experiences are bound to fail in an online synchronous, asynchronous, hybrid, or virtually enhanced learning environment. Many teacher education programs have a commitment to anti-oppressive pedagogies, and that commitment must extend into efforts to strengthen online pedagogies. For every new initiative that makes online teaching more robust and candidates more able to take the tools into their own hands, instructors must ask how and whether all their candidates will have equitable access to those tools.

Specific Implications for Teacher Education Research

We are living in a time for which we were not prepared, and as we argue, teacher education as currently conceived is unlikely to sufficiently prepare the next generation of teachers for teaching online without significant changes. We can assume that some learners will want and/or need to attend school online although we do not actually know what will come next, or how COVID and what we learned in 2020 and beyond will in fact shape the future of education. Therefore, the research we suggest is intentionally far reaching in scope. We believe that numerous questions need to be asked and answered if we are to fully prepare for what follows—and especially if we are to move to a better approach to remote instruction for all learners. Based on what we have learned since the onset of the COVID-19 pandemic, we believe that the following future research is needed:

- exploration of effective systems of support for teachers, teacher candidates, and teacher education faculty in learning transferable digital literacy knowledge and skills;
- analysis of the problems and possibilities for a fully online clinical experience in teacher education;
- effective systems of information and learning management for fully online teaching and learning experiences in both P-12 and higher education;
- exploration of systems of data collection, surveillance, and privacy;
- anti-oppressive education in an online environment.

Although additional areas of research will continue to emerge, we feel that the above listed topics are the most pressing for teacher education. The year 2020 taught us so many things, and above all, it taught us that we cannot take for granted that teaching will always occur face-to-face. It is incumbent upon educators everywhere—and especially teacher educators—to explore what worked and what did not in order to improve the future landscape of teacher education. We live in a different world than we did 10 years—or even 10 weeks—ago, and COVID's impact on the future of schooling has yet to be fully written, but it will undoubtedly affect teacher education for years to come.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors received no financial support for this research.

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