Creating Teachers' Digital Toolboxes through Modeling: Lessons Learned from Technology Rich Teacher Education Classrooms

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Abstract

From sending texts around the world to following Snapchats from traveling celebrities, humans are more globally-connected than ever before. Interactions around the world that seemed impossible 20 years ago are now literally at our fingertips. Due to the increases in technology, education can no longer be seen as an entity unique to individual countries but rather, an integrated system of cross-cultural societies. With these shifts comes changes to education. Students learn through technology and teachers must adapt their instruction to best fit their students' needs. As a result, teacher education must become more focused and deliberate about preparing future and current teachers to utilize technology effectively. Linking digital literacies with modeling, we include two perspectives on integrating technology into teacher education. The first perspective is from a former middle school teacher who now instructs preservice teachers, while the second perspective is from a former K-12 teacher who now primarily instructs in-service teachers seeking graduate degrees or additional training. After reflecting on the two experiences, we summarize lessons learned and provide recommendations to other literacy teacher educators.

Key Words: technology integration, strategies for technology instruction, teacher education, sociocognitive theory, self-directed learning

Introduction

From sending texts around the world to following Snapchats from traveling celebrities, humans are more globally connected than ever before. Social media can be used for personal pursuits, but educators are also finding innovative ways to use technology to transcend the four walls of the classroom. For example, students in a classroom in Austin, Texas can use Skype to share experiences with children in Rio de Janiero, Brazil during the 2016 Summer Olympics. Students in Little Rock, Arkansas can post blogs about using different mathematical equations to solve problems, and students in Hong Kong, China can respond to those blogs with comments and feedback. Interactions that seemed impossible even 20 years ago are now endlessly possible.

Due to the increases in technology, education can no longer be seen as an entity unique to individual countries (Kihoza, Zlotnikova, Bada, & Kalegele, 2016). Instead, education is global. Not only are students ca-

pable of communicating easily across international boundaries, but they also have unprecedented access to information. In 2012, Wakefield and Smith described the changes technology has on teaching by stating that students should not only learn to locate, evaluate, and utilize information, but must also determine from where the information comes and from what culture. Clearly, this requires a skill-set, which goes beyond information literacy.

Therefore, technology has not only shaped how students learn but challenges teachers to improve how they teach. In summary, teachers must be:

1. competent with technologies,
2. comfortable with societies and cultures around the world, and
3. confident in teaching both technology-based and culturally-relevant lessons.

For teachers to accomplish these three goals, teacher educators must prioritize technology, and the many components that go with it. In this paper, we provide strategies and in-class instructional ideas for promoting these three goals in teacher education. To support the variety for improving teacher practice, we include perspectives from a teacher educator who primarily instructs preservice teachers, as well as a teacher educator who prepares in-service teachers seeking advanced degrees. After reflecting on our own experiences with technology, we summarize lessons learned and provide recommendations to other literacy teacher educators.

Digital Literacies in Teacher Education

Currently, teachers must perform a balancing act when it comes to their use of print-based and technology-rich resources. From one perspective, traditional print-format textbooks, children's books, and other resources are used as much as ever. Students relish the opportunity to hold a book and feel the pages as they turn. On the other hand, teachers are encouraged through legislation, national standards, parents, and other stakeholders to incorporate as much technology as possible, including digital texts. Digital texts, or digital literacies, are commonly thought to include multimedia-based literacies like videos, Internet webpages, electronic readers and mobile devices (Gainer & Lapp, 2010; Karchmer-Klein & Shinas, 2012).

However, the integration of digital literacies and traditional literacies in 21st-century classrooms influences an "immersion in meaningful design practice within a community of learners; overt instruction in the metalanguages of design; examination of the social, cultural, and historical meanings of designs and design elements...and, opportunities for students to put their designs to work in new settings," (Seigel, 2012, p. 673). In other words, teachers cannot simply use a picture book one day and a digital story the next and hope to be thought of as a balanced teacher. Digital literacies do not only apply to traditional modes of reading that are now digitalized, such as picture books which are -aloud through video sites such as YouTube. Instead, students must be able to read, inference and interpret learning material that is not necessarily word-based, but still requires the cognitive skills of reading like comprehension, syntheses and analysis.

Most classrooms today "continue to

privilege traditional texts, beliefs, and forms of reading and writing like textbooks, storybooks and printed materials" (Lapp, Moss, & Rowsell, 2012, p. 367). One reason for a continued emphasis on traditional literacies is the limited accessibility in many classrooms to digital literacies like online sources, ebooks, digital sources and the like (Lapp et al., 2012). Teachers struggle to meet the technology demands of the Common Core State Standards, students, and society (Leu et al., 2014; Shanahan, 2015).

Teachers are required to teach skills for processing multimodal literacies, which differ greatly from the processing skills required to understand traditional literacies (National Reading Panel, 2000). Multimodal literacies move beyond print-based media to include videos, gestures, graphics, and illustrations. When students use multimodal literacies, teachers are further challenged to deliver instruction that is rigorous in preparing students for advanced cognitive tasks. For teachers to successfully prepare students to interact with and comprehend new literacies, they must first be proficient in the use of these literacies. This proficiency allows teachers to transcend their knowledge to their students, creating a generation of learners who navigate the wealth of knowledge available, quite literally, at their fingertips.

Theoretical Framework for Using Technology

Education is multifaceted and complex, particularly in relation to teacher education and the programs that prepare future and current teachers. Teacher preparation programs are responsible for preparing qualified teachers and providing professional development to in-service teachers (Cochran-Smith, 2003). Therefore, we believe that it is valuable to focus on several theoretical constructs that support instructional practices at the teacher preparation level, which can be both distinctive and overlapping with K-12 pedagogical theories. First and foremost, teachers are not only educators but also learners. In discussing preservice and in-service teachers, we must consider theory emphasizing adult learners. Adult learners are fundamentally different than children and those differences must be considered separately from children. This difference is referred to as "andragogy", in contrast to "pedagogy", which refers to the science of helping children learn (Baumgartner, Lee, Birden, & Flowers, 2003; Knowles, 1980). Andragogy incorporates six assumptions that are the building blocks of adult education: (a) self-directed; (b) greater depth of experience; (c) developmental tasks; (d) focus on problem centered instead of subject centered; (e) motivation to learn is internal and includes the need to know why something is being learned (Baumgartner et al., 2003; Knowles, 1980, 1990; Merriam, Caffarella, & Baumgartner, 2007). Using andragogy as a baseline, we consider each of these six assumptions when preparing preservice and in-service teachers to use technology comfortably and effectively. In the following sections, we describe three theories that support technology integration in teacher education settings: 1) social-constructivist theory; 2) social cognitive theory; and 3) self-directed learning theory.

Social-Constructivist Theory in Teacher Education

Social-constructivist theory posits that experience facilitates learning (Vygotsky, 1978). From a Vygotskian lens, social constructivism emphasizes how knowledge is accumulated through social and cultural processes. It is a process of changing and modifying knowledge through collaboration with others (Wink & Putney, 2002). Learning is attained not only through isolated learning opportunities but also through collaborations and dialogue (Wilson, 2003). Therefore, learning is created by societies and influenced by culture, as each society values different experiences. When considering preservice and in-service teachers, social-constructivist theory indicates that teachers learn through collaborations and build knowledge from their experiences in the classroom. This can include clinical experiences of preservice teachers, or practicing teachers' own classroom experiences.

Social-constructivists acknowledge that abstract thinking is complex, and that people learn information more deeply when learning is concrete (Unrau & Alvermann, 2013). Often, technology falls into this category. While many individuals are comfortable using technology such as smartphones on a daily basis, they may become uncomfortable when trying to determine the most effective ways to monitor students' comprehension with technology. Moreover, if preservice or in-service teachers are only taught the theoretical or conceptual understandings of technology, they will not be able to confidently implement technology. When instructing with technology, teacher educators have a strong responsibility to provide opportunities to practice using the technology, model methods of incorporating the technology, and discuss alternative strategies related to using technology.

Preservice Teachers. Many teacher education programs accomplish the task of making teaching more concrete by allowing students to complete clinical experiences in the field (Darling-Hammond, 2010). Preservice teachers may conduct observations, provide small group instruction, or teach demonstration lessons in these experiences. Through these opportunities, preservice teachers match the theory of their teacher education program courses to the practice of being a teacher. In some cases, preservice teachers may not be able to work as closely in schools. A variety of obstacles including mandated limitations on course hours toward graduation, struggling public school systems, and insufficient resources may prevent preservice teachers from getting more than a few hours in schools, if any. In this manner, technology can be a powerful tool for teacher educators. Teacher educators can use videos to show demonstrations of teachers, which give preservice teachers much needed observations of real classrooms. Additionally, through features like FaceTime, Skype, and Google Hangouts, teacher educators can live view classrooms for preservice teachers. Here, preservice teachers can have conversations with teachers and students as lessons are being completed. These experiences capitalize on technology while allowing preservice teachers to learn through simulated experiences.

In-Service Teachers. As previously mentioned, in-service teachers have concrete

knowledge from their experiences in the field, but they crave the theoretical framework to improve their own teaching (Hodges, Feng, Kuo, & McTigue, 2016). Technology is a resource that can help make the abstract learning of theory and conceptual frameworks more meaningful to what teachers already do in their classrooms. Similar to preservice teachers, in-service teachers can use technology to record their classroom environments and teaching practice. They can then bring those videos to the teacher education setting. By observing their own teaching and the teaching of other practicing teachers, they can see concrete examples of what is being discussed in their professional development.

Social-Cognitive Theory in Teacher Education

Social-cognitive theory is most notably attributed to the work of Bandura (2001), who described the idea of shifting a person's view of his or her ability to complete a task. This concept, known as self-efficacy, reveals that when people believe they are capable of completing a task, they are more likely to succeed in the task (Bandura, 1997). Specifically, Bandura (2001) states that self-efficacy is built through several key components: practice, effective models, and challenging previously held beliefs. By building self-efficacy, social-cognitive theory has significance for preservice and in-service teachers (Merriam et al., 2007). Current research on self-efficacy shows that teachers who demonstrate a high sense of efficacy are more likely to diversify their instructional strategies, utilize multiple genres of text, and engage students in various grouping methods to improve student achievement (Tschannen-Moran & Johnson, 2011). Therefore, preservice teachers and practice teachers should be tasked with practicing instructional methods, observing effective models of teaching, and challenging their previously held beliefs about teaching. Additionally, these examples should include technology to ease the challenge of bringing technology into the classroom.

Preservice teachers. Again, technology serves an important purpose in increasing preservice teachers' self-efficacy for teaching. First, technology is often a skill in which preservice teachers have low self- efficacy and little support. By seeing effective models of teacher educators using technology, preservice teachers can boost their confidence and better understand how to integrate technology in their own classrooms. Through technology-rich teacher education programs, preservice teachers can learn about the most up-to-date technologies and features, while mastering how to problem-solve when the technology falters. Additionally, preservice teachers will be given the skills they need to continue learning about technology.

In-Service Teachers. Second, practice is key to learning any skill. When in-service teachers are given opportunities to use technology, they become more comfortable with it. For example, if a teacher has never used an interactive whiteboard, such as a Smart Board, before, he or she may feel uncomfortable even presenting a PowerPoint. If that teacher works in a district that only uses this technology in classrooms, he or she may not enjoy going to work. However, if teachers master using interactive whiteboards, they will be more confident when using the tech-

nology in their practice. Additionally, if preservice teachers and in-service teachers are taught the skills to learn new technology, technology will not be an overwhelming source of stress in teaching.

Self-Directed Learning Theory in Teacher Education

Self-directed learning is defined as a process of learning in which people plan, execute, and evaluate their own learning (Merriam et al., 2007). For preservice and in-service teachers, self-directed learning is a large component of their profession. Preservice teachers are guided by their teacher education program, but must often take initiative to learn additional skills they may have forgotten or not mastered in their K-12 education. When preservice teachers begin their teaching careers, they are expected to continuously remain updated on policy and legislative changes in education as well as current research-based practices. Much of this learning occurs outside of the formal work environment or professional development. Self- directed learning does not relieve the educator of teaching responsibilities, but places the responsibility of gathering, evaluating, and using information on the teacher (Jarvis, 2010). Through self-directed learning, the teachers at every stage of their career are using their autonomy to continue to develop and learn (Jackson, 2009; Jarvis, 2010).

Preservice teachers. Preservice teachers must acquire the skills to learn new technologies, and these skills are often learned through independent learning. Unfortunately, in a traditional, four-year teacher education program, some technologies may no longer be used when the candidates reach their own classrooms. Given that many teacher preparation programs are less than four years, it is more salient that preservice teachers are given the tools to learn about technology independently. Because technology changes rapidly, teacher education programs show more promise if they equip preservice teachers with the skills and resources to learn about new technologies successfully, rather than emphasizing individual pieces of technology. For example, Karchmer-Klein & Shinas (2013) outline several principles that support teachers' self-directed learning of new technologies. Focusing on these principles and developing preservice teachers' aptitude for exploring new technologies and locating assistance when they need it will help them develop confidence in using unfamiliar technology.

In-Service Teachers. In-service teachers face similar and unique challenges when learning about new technology independently. Depending on how long a teacher has been in the classroom, he or she may have faced numerous changes in technology, all requiring additional skills and knowledge. This can become exhausting while also developing countless skills that can help teachers support student learning. In-service teachers primarily hunger for motivation and concrete support when learning new technologies. In teacher education programs where practicing teachers are obtaining additional specializations or degrees, teacher educators can focus on practice that help teachers learn new instructional practices that are supported by technology. Additionally, teacher educators can provide ongoing professional devel-

opment that includes coaching and continued mentoring. In-service teachers thrive when they have resources available to them, particularly when they have questions or when technology does not work appropriately. In summary, while similar challenges face preservice and in-service teachers, teacher educators should alter their approaches to best help each group of teachers.

Bringing the Three Theories Together

By considering social-constructivist theory, socio-cognitive theory, and self-directed learning theory, teacher educators can consider preservice and in-service teachers as adult learners with unique needs. First and foremost, we argue that teacher educators should be mindful of how they are using technology in their own practice and what technologies they are exposing teachers to. Some technology may be outdated by the time teachers try using them, or some districts may not have the same resources to use technology. Therefore, it is more important that teachers at all levels of the profession know strategies and resources for learning about new technology. These skills will prove more valuable over a career and will keep teachers motivated and encouraged to utilize technology. Second, we acknowledge that teacher educators should be fearless in modeling technology in their classrooms. Additionally, teacher educators need to discuss why the technology works and how it promotes student learning. Preservice teachers need to see that technology is not used for technology's sake, but improves the learning experiences of children. In-service teachers need to be convinced that technology is worth the time and effort and helps students in a unique way. Finally, teacher educators need to provide preservice and in-service teachers with opportunities to practice [CS7] and learn about new technologies. These experiences will help all teachers better understand the benefits and limitations of different types of technology, while building their confidence in using technology for instructional purposes.

Two Perspectives on Modeling Technology Pedagogy in Teacher Education

Tracey is a former middle and high school English teacher, who now prepares preservice teachers for initial licensure. She teaches both traditional preservice teachers in a teacher preparation program, and master's students who have already completed their college degree and are now seeking first-time licensure. She teaches a variety of literacy courses that include content area literacy, research trends, and assessment practices. In contrast, Chyllis is a former K-12 teacher with more than 20 years in education. She taught early elementary and middle school grades as a classroom teacher and a Reading Specialist. She prepares teachers who are seeking additional licensure and advanced degrees. Many of her students have teaching experience and are continuing their education with a desire to learn the latest research-based methods. In the following sections, we detail some of our experiences with technology and how we utilize technology in teacher preparation.

Tracey's Perspective

My interest in technology grew when I taught in K-12 settings. Because I taught

students who were often one or more grade-levels behind, I needed to teach foundational literacy skills. For example, while teaching 7th-grade, many of my students' reading levels were still at the elementary level, meaning they struggled to read with fluency and decode multi-syllabic words. I found that by integrating technology, I could teach basic skills while appealing to my students' interests and keeping them engaged.

One such lesson included using iPads to teach spelling patterns. My goal was to teach the students spelling patterns and then transition that skill to decoding. As a secondary goal, I hoped the activity would build my students' self-efficacy with spelling to make them more confident writers. Using Inspiration software on the iPads, my students engaged in a word sort where they could drag and drop words into different columns. After this activity, as a class, we discussed how the words could be grouped and assigned each group a spelling rule. These rules were added to the students' individual resource folders for writing. I could continue these word sorts over time, building my students orthographic knowledge continually.

As I transitioned to higher education and began preparing future teachers, I realized the same motivations for using technology assisted my preservice teachers. Many of my students are traditional students, in the sense that they are continuing education directly from high school. Most of these preservice teachers can be described as "millennials" and represent a transitional period of life from adolescent to adult (McGlynn, 2005). One interesting perspective these students bring is that they are engaged by and enjoy technology, but because it is so engrained in their lives, they become frustrated if the technology-based instruction feels forced or unthoughtful. As a result, I am conscientious to use technology as effectively as I can and to continually direct my students to the purpose of using a specific device.

Flipping the Classroom. One method for incorporating technology into my teacher preparation classes has been through the pedagogy of the flipped classrooms (Hodges & Weber, 2015). For each class I teach, I prepare videos, audio-recorded PowerPoint presentations, and online modules for students to work through prior to class. Combining these materials with course readings, students receive a "first exposure" to the content before class begins and every class starts with specific questions and clarifications initiated by the students (Engin & Donanci, 2014; Hodges & Weber, 2015). These first exposures allow preservice teachers to self-monitor their progress through the content and allow instructors to differentiate the content to meet each student's individual needs. This approach also prevents the instructor from spending lengthy amounts of time lecturing.

When preservice teachers enter class, the first 15-20 minutes are spent clarifying key points, answering questions, and connecting new content to previously learned material. Then, much of class time is spent on in-class activities, which range from discussions to hands-on practice of the content. For example, when teaching about assessing readability, preservice teachers come to class having reviewed material to set their foundation of what readability is and how it can be meas-

ured. During class, I reiterate the key points. Then, preservice teachers use their own devices to assess the readability of children's picture books I supply in class. The preservice teachers determine the readability based on their own knowledge then use an online readability calculator to determine the actual readability from a variety of formulas. Finally, in groups, preservice teachers read the book and determine, based on interest, content, and structure, grade-level appropriateness. Through this activity, preservice teachers use technology to understand the usefulness and limitations of readability and begin to consider additional factors for choosing texts for students.

By using a flipped classroom approach, my preservice teachers get more hands-on practice and spend less time listening to lectures (Engin & Donanci, 2014). I am able to provide my students with various technologies through their at-home sessions, and preservice teachers' can self-regulate their own learning. Some preservice teachers view the materials once, while others view the materials numerous times prior to class. Preservice teachers also report that they enjoy having the materials to look back to later in the semester and even while they are in their first few years of teaching. Finally, the flipped classroom approach models student-centered teaching in which the students drive instruction and activities, while the teacher is a facilitator to their learning.

Bring Your Own Device – The Many Possibilities. The rule in my classroom is that preservice teachers are encouraged and expected to bring their own device to class (Johnson, 2012). Devices include Smartphones, tablets, computers, and mini mobile devices. During class, the preservice teachers are given both structured and unstructured tasks that require the devices. For example, I utilize various small group activities to model different pedagogy strategies. In these activities, at least one small group requires the use of a device to look up information and resources. In this structured task, preservice teachers see how their devices can be used to find and store information for teaching.

Additionally, during class, I often pose questions that require preservice teachers to do a quick online search. In this activity, preservice teachers see how they can integrate devices into their own classes. Devices provide students with freedom, give them an opportunity to use devices that they often use outside of class, and help them learn to facilitate their learning and dissecting of information.

Using Applications. Finally, in my class sessions, I turn to applications to help preservice teachers remain engaged and monitor their understanding of course content. A common struggle for teachers has consistently been eliciting full class participation in class-wide activities (White, 2011). Devices can be used to increase participation and help the teacher monitor individual students' understanding of the material. This monitoring of student comprehension and active participation by students is an educational trend that began early in education (Dewey, 1938) and has continued into the modern era (White, 2011). While eliciting participation from every preservice teacher, every day is a challenge; I find that three applications help keep my preservice teachers motivated, engaged,

and interested in course content: *DoodleBuddy, eClicker,* and *NearPod.*

DoodleBuddy is a simple application that allows the user to "doodle" or draw as they like on a white, or other color should the user choose, screen. This application can be used as an interactive whiteboard, free to manipulate at the fingertips of each preservice teachers. When the I ask a comprehension question, preservice teachers can use their finger to write the answer on the white board then show me their answers. This is a quick, easy and mess free may to ensure that preservice teachers are (a) paying attention to the lesson, (b) making logical connections between new and old material and (c) are active members of the instruction (Turel & Johnson, 2012).

Too often, preservice teachers act as sponges absorbing information and regurgitating that same information later. This simple strategy of using white boards ensures that preservice teachers are not acting as sponges but rather living organisms absorbing the information and processing it for future use. Additionally, for teachers who are short on time, resources or supplies, the interactive whiteboards are handy. It takes a great deal of time and resources to create flipbooks or maintain dry erase markers; it takes relatively little time to tell students to open their device and click on *DoodleBuddy*. The white board allows for student choice and creativity. Preservice teachers can write, draw, create graphic organizers, type or embed pictures onto their whiteboard, allowing them freedom, creativity and motivation to participate in class. Finally, this same strategy can be used in K-12 classrooms, so it once again models an effective use of technology for preservice teachers.

For teachers that prefer multiple choice questions or at times when teachers choose to practice these types of questions, there is *eClicker*. This application serves as an electronic clicker for students to respond to multiple-choice questions. I create a bank of questions and then choose the ones I want to use in a particular class session. I connect my device to the *eClicker* Host application using a wireless Internet server, and the preservice teachers then connect to the same wireless Internet source and type in the address of my *eClicker* Host. Once this is completed, I can ask students questions throughout the lesson and have the preservice teachers select a multiple-choice answer on their device. The data is sent to the host and I can quickly see what choice students chose to determine understanding. I can also monitor how many students are actively participating to ensure active cognitive engagement is occurring in the classroom. Teachers can adjust their teaching and decide whether to move forward with instruction, reteach or scaffold the lesson for increased comprehension using clicker technology (Anderson, Healy, Kole & Bourne, 2011).

Finally, a device I enjoy using to help students work through course content is *NearPod*. *NearPod* serves as an interactive presentation format, much like PowerPoint. As the teacher, I combine PowerPoint slides, Internet links, and videos to create a presentation. This presentation can be connected to by preservice teachers through a code, or I can assign the presentation as homework. For homework use, students work through the presentation, which can also include short

answer responses, quizzes, or polls. Each preservice teachers' information is compiled into a report and sent to the teacher educator. This is a great feature for integrating into a flipped classroom.

For in-class use, I allow students to connect their own devices to my link. This makes the presentation live. As I go through slides in lecture, the preservice teachers' slides automatically move as well. If a preservice teacher leaves the presentation (closes out to go to another application, for example), I am notified. This keeps preservice teachers engaged and holds them accountable for being present in class. As we come to slides that include an activity, short-answer response, quiz, or poll, preservice teachers answer individually, and my device anonymously shows me responses. I can then share the entire classes' responses or I can self-select a certain students' response to share. Because it is anonymous, I am still in compliance with the Family Educational Rights and Privacy Act (FERPA). At the end of the session, *NearPod* emails me a report of each student's responses and time-in the presentation activity. This is an efficient way to document students' progress, understanding, and class participation.

Chyllis's Perspective

As an educator for nearly 20 years, I have experienced much change with pedagogy, andragogy, and classroom instructional practices. When I began my teaching career in California in 1996, I had two classroom computers with dial up Internet. My school had a computer lab with games for the students to "play" for 30-minutes per week, but the technology integrated into my own classroom instruction with limited and minimal to say the least. We did not stream videos or have interactive Smart Boards, our standard tube television would suffice, and the wall of whiteboards and overhead projector was our form of technology. At this early stage of technology integration and technology preparation for teachers, my technology preparation was inadequate. In my licensure program, I had one technology course entitled: *Educational Application of Computers.* This introductory course provided me with opportunities to practice working in Excel files, making PowerPoint slides, coloring, attaching Clipart, and writing in a Microsoft program. Such programs are now more commonplace and lack direct instruction; rather it is an expectation that students and teachers are familiar with this basic form of technology.

Now as a teacher educator I understand the importance of working "with" my students to learn and gain new knowledge and skills pertaining to integrating technology as a resource for pedagogical practices. I also reiterate the importance of technology as a tool to support student learning and assessment, but not as a replacement for the pedagogy.

First, I acknowledge that preservice and in-service teachers enter education programs with vast and differed experiences, this includes their experiences with technology, and thus I strive to include some form of technology in each class session. As an teacher educator for in-service teachers, my education students range from early post baccalaureate (just recently graduated with their undergraduate degree); students with Teach for

America (TFA) who have recently relocated to the area to start their first teaching assignment and often have minimal to no previous teaching experience; students who are working toward their alternative route to licensure (ARL) typically with a degree in another field and they are in their first or second year of teaching; current in-service teachers working towards their master's in education; and, doctoral education students. Although these students are in different programs, most of them are classified as in-service teachers—this is because they are already teaching and have their own classroom. Additionally, this range of students also span the age gap, from "millennials" who have recently turned 21 to the "non-traditional" students who are returning to school, or who have retired from their first or second career and are continuing their education. I believe these details are pertinent because just as I teach my preservice teachers and teachers, I need to know my students. It is important to know where they come from and what experiences they have. This information helps to guide my instruction, but also helps me to know how much scaffolding is needed. For this reason, I strive to weave the course content and application with technology and particularly with new and digital literacies.

Using Technology as a Tool to Participate and Instruct. One way for incorporating technology into my education courses is by supplementing the course through an online platform, such as Edmodo, "Edmodo is where education meets innovation" (Edmodo.com, 2016, para. 1). Edmodo is a social learning network and educational technology that offers an online platform for teachers and educators to provide instruction and communication. For some, it is described as the educational Facebook that provides a learning environment beyond the face-to-face instruction. It is acknowledged that there are many other online platforms, such as eLearning, Blackboard, and Webcampus, but these educational technology companies are often purchased and financially supported by higher education institutions. Whereas, Edmodo is a free service for teachers and their students to communicate, and for the K-12 classroom it also has an option for parents. Other advantages to Edmodo are the tools, which include: discussion boards, assignments, quizzes, and polls.

This form of technology is utilized in my instruction to help the teachers not only organize their courses, but also provide them with an opportunity to learn how to implement technology into their own instruction. By using Edmodo, the teachers may also join other Edmodo interest topics (e.g., English language arts, mathematics, science), join their school or district, and communicate with other teachers for support and lessons.

Another View for Classroom Instruction. In preparation of teachers I want my students to have as many takeaways as possible. For example, in-service teachers must complete assignments for their own course work, but this work should be tangible for their classroom teaching. Therefore, I often encourage my in-service teachers to utilize webpages as a source for collecting, presenting, and managing their work. This can be achieved by using free webpages or websites such as, *Google Sites, Squarespace, Wix, Weebly,* and *Wordpress* to name a few. These websites are cloud-based and can be accessed

from almost any device. Additionally, these webpages are platforms that provide templates to help teachers to organize their own course work, as well as their class. These spaces provide the developer (i.e., teacher) with a link that may be shared with others. For example, in their college courses the link can be shared with the instructor or classmates, students and parents may also be granted access. The advantage of developing a webpage is that the teacher has ownership of it, but it also a place to manage their work and classroom (e.g., student work, home work, assignments, projects, etc.).

Using Applications. Similar to Tracey, I too use applications (apps) to help in-service teachers supporting their teaching, manage their instruction, and assess their students. Applications provide teachers with tools to support their instruction, they can share apply various applications and devices through their teacher preparation courses and in turn put them into practice into their own instruction. Three applications that are utilized in my courses to support my in-service teachers include: *Kahoot!, Seesaw,* and *Plickers*.

Kahoot! is a free application that "is a game-based learning platform, allowing both educators and students to research, create, collaborate and share knowledge" (2016, para. 26) . *Kahoot!* is usually displayed on a white board or used in conjunction with Smart Boards and are designed as a learning tool to be used socially, as a whole class, with small groups, or individually. The application allows the user to develop quizzes, discussions, or surveys. An excellent way to formally assess students, this tool can be used by teachers for their students and classrooms, but is also an excellent tool for adult learners. The instant feedback and discussions can be used as mini-lessons for content clarity and allows instructors to check for understanding, or evaluate who actually completed the required reading prior to class. Kahoot! also has a database of quizzes on assorted topics that may be accessed and allows the user to input their own content. Typically used an entrance ticket (i.e., quiz) in my courses, the in-service teachers are engaged in both the learning and assessment process.

Additionally, teachers are required to evaluate and assess their students on a regular basis, an application for formative assessments and portfolios is *Seesaw*. The Seesaw application is designed to "[empower] students of any age to independently document what they are learning to school" (Seesaw, n.d., para.1). A K-12 application for all content areas, Seesaw provides students with opportunities to save and document their learning. A process that has traditionally been the responsibility of the teacher is now a collaborative learning process. Students take ownership of the learning and their individual digital portfolios are stored on the Seesaw application, which allows teachers can monitor student progress and evaluate the end products. The portfolios can also be used as a tool and example of student work for parent teacher conferences, and help to keep parents actively engaged in their child's learning.

Third, *Plickers* is a low-technology application tool that allows teachers to use technology in their classroom instruction with real time feedback and data on student learning. Plickers is another assessment tool that can be used in a variety of different ways: pre

-assessment, exit tickets, warm-ups, on-going check for understanding. It is best used with a device with a larger screen when doing it whole group or may be best utilized in a small group setting. Plickers allow teachers to engage the students in the process without the need for individual student devices (e.g., clickers, phones, tablets). To effectively implement this application, teachers need to acquire/print out paper clickers, once each student has their assigned paper clicker the teacher can scan the paper clickers, this process requires that the teacher use a device, such as a phone or iPad to scan the student responses. The responses are instantly tallied and are automatically saved.

Each of these applications have been used for instruction, evaluation, and progress monitoring of my in-service teachers; additionally, teachers are engaged in the process and understand the need for technology in their own instruction. The in-service teachers are encouraged to apply their learning in their own instruction. Through using applications regularly in the course, I provide opportunities to practice using unfamiliar technology. In this way, teachers become comfortable and confident with the technologies. Hopefully, this practice encourages them to use the technology in their K-12 classrooms. Finally, I am an additional support for teachers as they experiment with technology. For example, if a teacher wants to use Kahoot in their classrooms, they can test it out and ask me questions prior to implementation. This provides a safe space for teachers to gain self-efficacy with technology and different instructional practices.

What We Have Learned About Technology in Teacher Education

Through our unique experiences in using technology with both preservice and in-service teachers, we have learned several lessons worth sharing for other teacher educators who are committed to utilizing technology effectively. We can summarize our lessons into four big ideas.

Lesson #1 - Novelty Creates Engagement

Teacher appreciate novelty and continually learning about new technologies. Each time we integrate a new technology into the classroom, we always expect some resistance but experience very little. The students are engaged and interested in the content because they enjoy the technology. From this viewpoint, novelty can be a way to re-invigorate teaching.

From the future teacher perspective, preservice teachers are hungry for tools and methods for managing a classroom and eliciting interest in their students. As such, they want to learn about as many devices as they can. Preservice teachers are ready to accept the technology they see modeled because they can see the potential for how it will improve their own teaching once they have a classroom. Teacher educators want to give preservice teachers as many resources as possible so that they are prepared when they have their own students.

From the in-service teacher perspective, many are facing challenges in the classroom. Some many feel tired, unmotivated, or worried about student achievement. Again, as a result, they are excited about methods that

increase students' attention and re-invigorate their teaching. New technologies and resources can be a tool to help organize their teaching, while also tracking and managing student work and progress. Additionally, when technologies are modeled effectively, they become a resource that teacher can take into their classroom and use immediately. For example, many of the applications we describe in our perspectives can be used within a few minutes and take little time to master. In-service teachers, therefore, can go to their classrooms directly after class and make small improvements that will have big gains.

Lesson #2 – Consistency is the Only Path to Implementation

While novelty can build enthusiasm, and grab teachers' attention, it is not sufficient for mastery of technology content. Technology should be approached as any other content. Practice will lead to mastery, and practice cannot occur if there is zero consistency. For this reason, teacher educators should pick a few technologies and hone those well. For example, in Tracey's class, she utilizes a flipped classroom pedagogy and uses certain applications on preservice teachers' own devices. By only focusing on a few technologies and teaching them consistently, she keeps novelty but preservice teachers have the opportunity to master the technologies.

While in Chyllis's instruction, the in-service teachers are not only the students they are also a learner. The course content and the technology content are integrated to support their learning, but is also applicable to their own classes and students. They can make the connection from theory to practice in real time, while also communicating with their peers on integration, application, content, and lessons.

Lesson #3 – Technology Integration Takes Time in the Beginning, but Yields a High Pay-off

When a teacher educator decides to use technology in their classroom, more than just through presenting content, it is a big time investment. The teacher educator must research technologies and spend time working with the technology to master it. Additionally, traditional methods of teaching and delivering content do not work as effectively with technology, so the teacher educator must adjust their pedagogical approach. These changes take a great deal of time and effort. Additionally, similar to K-12 settings, using technology may be difficult initially. Some class time may be lost through technologies not working, adjusting preservice teachers to the new learning methods, and lesson that do not work as planned.

However, despite some of these limitations, the reality is that they are minimal. One class day may be affected by technology not working, but if the teacher educator has mastered the technology, this will not occur often. Instead, there will be a big pay-off in preservice teachers' interest level, motivation, and skill as teachers. Additionally, this is the only way preservice teachers can truly build their own skills as teachers using technology.

Lesson #4 – The Learning Never Ends

Most importantly, because technology is constantly changing, the learning never ends. A teacher educator cannot be complacent and believe that they have learned all there is to know about technology. Instead, teacher educators must have a growth mindset. That is, they must believe that they can continuously learn about and utilize new technologies. Through our experiences, we are constantly working to learn about new technologies. Even as we write this manuscript, new technologies are being created and previously used technologies are becoming outdated. For these reasons, teacher educators must make conscious efforts to never cease learning about innovations. Several ways we have maintained our enthusiasm for technology is through online blogs and journals, which often report on ways to use technology. We have also attended professional workshops and conferences devoted to technology. Most importantly, we are continually asking our preservice teachers about technologies they use, for pleasure and teaching. By making continual learning a priority, we ensure our teaching helps our teachers and future teachers be as prepared as possible to use technology effectively.

Technology is ever-changing and what works today may not work as effectively tomorrow. For that reason, it is critical that teacher educators continually learn about new technologies and work to integrate them into their classrooms. Not only will this maintain interest and engagement from preservice teachers, but it will model effective practices they can utilize in their K-12 classes in the future.

Recommendations to Teacher Educators

1. **Explore new technologies.** We recommend budgeting some time often to explore new technologies and enjoy them. Spend an hour each week browsing new applications and playing with them. Not only is this a fun stress-relief, it can bring about new creativity and ideas for class, even if the teacher educator does not use the application. To get teacher educators started, we provide a table of resources we have used in our literacy courses (see Table 1).
2. **Ask the tech-gurus you know.** Some campuses have a technology department that is focused on bringing the newest technologies to faculty, but often they are used primarily to fix crashed hard-drives. Make an appointment to meet with an instructional technology specialist and ask what they recommend. By scheduling the time, there is a focus of the meeting. These specialists can be a great resource for learning new technologies and getting mentorship. Additionally, many will come support you in your classroom. If the university does not have a technology specialist, ask friends and family who know about technology or find someone online who can help. There are resources everywhere!
3. **Provide opportunities for teachers to share technologies.** This can be a class assignment or a simple sharing time. Ask teachers what technologies they know of, what they use, and allow them time to share with the class. This can be a great way to

build a list of resources and gives preservice teachers the initiative and ownership over their technology experiences.

4. **Do not be afraid of technology working.** In our experiences, we continuously hear teacher educators hesitant to use technology because so many things could go wrong. While that may be true to an extent, often these hiccups are not as severe as they seem. Additionally, most can be solved quickly and easily. If the teacher educator is fearful of technology, likely preservice teachers will be too. If they see a model of a teacher educator who embraces technology and handles malfunctions effectively, they are more likely to view technology favorably.
5. **Students are great resources.** Often the instruction targets the students' learning, but when it comes to technology do not be hesitate to ask students about their experiences or preferences for learning and integrating technology into your class instruction. Especially with preservice teachers, many are using technology in their daily lives and can easily describe how they view technology. As an expert in teaching, the teacher educator can take these suggestions for technology and can apply them to education.
6. **Research the "Internet".** Due to increased Internet usage in schools, web site evaluation lessons should be implemented as a precursor to allowing students to conduct research in class or on the Web. Teachers need to provide instruction to their students about the reliability and validity of what they see and read on the Internet. One such lesson that may be utilized is the evaluation of the Pacific Northwest tree octopus (*Octopus paxarbolis;* Zapato, 2015) website. The Pacific Northwest Tree Octopus website (http://zapatopi.net/treeoctopus/) is thorough, provides precise details, and supports fact with evidence and research. This model lesson can teach students about authentication, which they can apply to independent research and future authentication lessons.

Conclusion

The world is becoming more global and is shifting greatly from year to year. Without a concentrated, dedicated effort to technology, teacher education will not parallel the demands of the workforce. Technology can be a scary part of education – both at the K-12 and teacher preparation levels. However, we have learned that technology, like anything else, can be learned and enjoyed through practice and dedicated effort. We hope our perspectives, strategies, and lessons learned inspire other teacher educators to embrace technology as an integrated part of teacher preparation. Through effective modeling, experimentation, and continual learning, teacher education can make great gains in preparing K-12 students for future jobs that may not exist today.

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Table 1. *Teacher Tools: Applications and Internet Resources*

Application/Resource	Link and Purpose
Camtasia	• Provides free trials and membership packages. Camtasia allows the user to record video of your computer screen. A program that is often used to develop lessons and tutorials. https://www.techsmith.com/camtasia.html
DoodleBuddy	• Interactive white board that students can write on with their finger to provide answers in class
eClicker	• Connects the instructor's device to students to allow for quick assessment and in-class engagement https://eclicker.desk.com/
Edcite	• Free platform for teachers and districts • Empowers teachers and engaging students with an online format for building, sending and reviewing assignments. https://www.edcite.com/
Edmodo	• Free web-based platform for educators that helps to support class structures, discussions, quizzes, assignments, etc. https://www.edmodo.com/
Educreations	• Community for teachers and students to use their iPad or web browser as an interactive whiteboard • Users can animate, create and narrate videos and share with other community members) • Available online or on iTunes: https://www.educreations.com/ https://itunes.apple.com/app/educreations-interactive-whiteboard/id478617061?ls=1&mt=8

Engage NY	• Webpage developed and maintained by New York State Education Department that provides educators with real-time tools and resources for educators • Open access and contains curriculum materials for grades Pre-K-12 in both English language arts and mathematics https://www.engageny.org/
ESGI	• An assessment software with 200+ preloaded assessments available and additional support (e.g., charts, graphs, reports, personalized parent letters, scheduling, and class management tool) https://www.esgisoftware.com/
Google sites	• Personal websites that are free or have a minimal fee that allows the owner to create and share a website https://www.google.com/sites/help/intl/en_GB/overview.html
iMovie/	• Video editing software that allows the user to create, develop and organizer video clips or films (for Mac computers, Apple products, and iTunes) http://www.apple.com/mac/imovie/ https://itunes.apple.com/us/app/imovie/id377298193?mt=8 http://www.apple.com/ios/imovie/
Inspiration software	• Visual learning tool that students and teachers use to develop and organize ideas into a graphic or visual representation http://www.inspiration.com/
iPads, iPhones, SmartPhones, laptops	• Personal devices that can be used by both the teacher and students for instruction, assessments, and other forms of communication.

Kahn Academy	• Ready-made videos covering course content and allows teachers to create online activities for students to complete • Teachers can track students' progress and assign them increasingly challenging tasks, based on their individual results https://www.khanacademy.org/
Kahoots!	• Application that is a free game-based learning platform that allows users to develop or use previously designed assessments, games, or activities https://getkahoot.com/
Nearpod	• Interactive tool that is free for teachers and includes research-based, interactive, ready to use lessons for grades K-12 https://nearpod.com/
Plickers	• A real-time tool for formative assessment data with minimal to no need for individual devices. https://plickers.com/
Prezi	• Presentation software that uses visual graphics, motion, to expand your presentation, lesson, or ideas https://prezi.com/
Seesaw	• K-12 application for all content areas, Seesaw provides students with opportunities to save and document their learning into individual portfolios http://web.seesaw.me

ShowMe	• ShowMe is an online learning community to create and share lessons via iPad http://www.showme.com/
Smart Boards or Digital/ Interactive Whiteboards	• Interactive whiteboard technology controlled by touch detection
Tabletop Twitter	• Tabletop Twitter is a strategy that can be applied to nearly every subject and may provide an opportunity to expose students to a variety of sources (such as artwork, story passages, articles, primary sources, poetry, etc.) • Use this activity to assess prior knowledge before teaching a unit or to build on current topics and allow student to delve further into the material • Tabletop twitter may be used as a part of a centers rotation or the whole class may be divided into smaller discussion groups.
Wix	• Wix allows users to custom design their own page and content, including text and videos • Good for classroom webpages, class portfolios, homework, and student and parent communication. http://www.wix.com/
Weebly	• Weebly allows the user to build a site or blog https://www.weebly.com/

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