EXPERIENCES OF TEACHER EDUCATORS UTILIZING TECHNOLOGY IN TEACHER PREPARATION PROGRAMS

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ABSTRACT

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The purpose of this qualitative, phenomenological study was to explore how and to what extent teacher educators evaluate, align, and demonstrate technology within teacher preparation programs. The literature revealed the need for teacher educators to follow frameworks, taxonomies, and standards containing technological, pedagogical, and content knowledge utilized appropriately within various contexts. In addition, teacher preparation program leadership can provide relevant and purposively professional learning as well as the support needed for teacher educators when the TPP leadership possess a basic understanding of adult learning. Using Teacher Educator Technology Competency #1, ten teacher educators were interviewed regarding their experiences utilizing technology within their teacher preparation program. The findings revealed teacher educators, whose technological knowledge, skills, and attitudes varied, utilized a variety of paths in the evaluation, alignment, and demonstration of technology. When their knowledge and skills were put to the test during the COVID-19 pandemic, most teacher educators transitioned smoothly to the various formats required by the pandemic and have also seen the "blessings in disguise" from this global challenge. Leadership varies among the institutions represented in the study, particularly in the area of technology integration. Many teacher educators have stepped up to the plate and provided the needed leadership in technology integration. This study has implications for policy and practice in the realms of teacher educator technology competencies, technology infusion throughout teacher preparation programs, professional learning, and leadership.

This dissertation is dedicated to my Lord and Savior, Jesus Christ. He has guided me every step of the way. Without Him, I could not have completed this monumental task.

"And I am sure of this, that he who began a good work in you will bring it on to completion...."

Philippians 1:6 ESV

Soli Deo Gloria

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CHAPTER 1: INTRODUCTION

Background of the Problem

Research reveals that many teacher educators are not teaching about technology or teaching actively with technology within teacher preparation programs so that teacher candidates enter the K-12 classroom with the necessary 21st century classroom technology skills (Clausen, 2020; Ottenbreit-Leftwich et al., 2015; Stoke-Beverley & Simoy, 2016). This lack of teacher educator technology competency creates an issue because future teachers duplicate the behavior modeled by teacher educators (Kalonde & Mousa, 2016). Ultimately, the same behaviors transfer to the student in the K-12 classroom. The COVID-19 pandemic accentuated the need for teacher educator technology competency and to reconsider the traditional higher education learning format (Krishnamoorthy & Keating, 2021).

A technology-infused teacher preparation program (TPP) is no longer an option, but an obligation of higher education. Multiple organizations have created guidelines or standards which include a technology-infused TPP that supports and enhances active student learning (CAEP, 2013; ISTE, 2018; Stoke-Beverley & Simoy, 2016). The responsibility for providing a program-wide technology integrated model for teacher preparation lies not only with teacher educators, but also with the school leadership (Clausen, 2020; ISTE, 2018; Sheninger & Murray, 2017). Kouzes and Posner (2002) state, “The truest test of credible leadership is what leaders pay attention to and what they do” (p. 83). The aspect that makes these leaders transformational is forward-looking (p. 111). Working together with teacher educators, school leadership should share their vision and model the way for transforming the teacher preparation program (Clausen, 2020; Sheninger & Murray, 2017). School leaders should work in collaboration with teacher educators and other relevant stakeholders to create a technology-infused TPP. The

transformational change within the TPP includes teacher educators achieving a basic technology competency. Part of this transformational change necessitates an ongoing professional learning program, designed to achieve short and long-term goals. Teacher educators then act as agents of change by providing teacher candidates with the vision of how technology supports and enhances active student learning and the skills needed for a 21st century classroom.

The Teacher Educator's Imperative

Today's pre-service teachers enter higher education with the prospect of learning what it is to be a teacher in the 21st century. From day one, these students should experience teacher educators who are models of 21st century educators, integrating technology throughout the classroom that supports and enhances active student learning. As leaders and models to the future generation of teachers, teacher educators should exemplify technology integration in the classroom thereby inspiring a shared vision within the teacher candidates, enabling them to duplicate the same skills in their future classrooms (Slykhuis et al., 2020; Stokes-Beverly & Simoy, 2016). The teacher educator's responsibility to evidence 21st century skills should occur not only due to the educational implications of graduating a generation of teacher candidates who are entering the classroom without adequate 21st century skills, but also the ethical and moral imperatives for educational leadership.

The Purpose of Education and Teacher Preparation Programs

If education stakeholders were gathered and asked what the purpose of education is, a lengthy conversation would most likely ensue. At the turn of the 20th century, the Committee of Ten designed an education system based on content that is still primarily followed today (Wagner & Dintersmith, 2015). This system may have worked in the early 20th century amid the Industrial Age, but this system leaves students behind as the 21st century advances exponentially

forward into the Technology Age. Many K-12 schools claim to possess mission statements promoting citizenship, character building, and critical thinking. However, content provides the basis of a student's evaluation, which is evident in the subject-based grade cards and testing (Wagner & Dintersmith, 2015, p. 39)

The question remains: "What is the purpose of a 21st century education? What does it look like?" Wagner and Dintersmith (2015) focus on four areas: discover passions and purpose, develop critical skills, inspiration, and citizenship. The world today changes at breathtaking speed. Students need to discover a variety of passions and pursuits instead of being pigeon-holed into one specific career choice. Developing critical skills, such as critical thinking and oral and written communication will enable students to pursue their various passions and goals. Considering a change to the purpose of education for the 21st century may increase an ethical environment of caring which promotes dignity and empowers the individual, allowing them to reach their potential. Students allowed to aspire to their personal passions may also see justice in action through increased participation and equal access (Starratt, 1991).

With a purpose for 21st century education, the focus of teacher preparation programs needs to shift from a one-sided content-centered instruction to a collaborative community wherein future teacher candidates develop instruction for personalized learning among students who use technology to create rather than consume. Teacher candidates as well as teacher educators should participate in professional learning communities to continually build their network and grow professionally (Nussbuam-Beach, 2020). Collaboration with partner schools produces relevant activities throughout the teacher preparation program (Stokes-Beverley & Simoy, 2016). Creating a 21st century teacher preparation program is contingent on program-wide and program-deep educational technology use (p. 35).

The Teacher Educator's Ethical Obligation

Sir Francis Bacon stated, "I hold every man [sic] *a debtor to his* [sic] *profession*; from the which, as men [sic] of course do seek to receive *countenance and profit*, so ought they of duty to endeavor themselves, by way of amends, to be *a help and ornament* thereto" [italics added] (Bacon, 1596). Why is a person a "debtor to his [sic] profession"? When an individual enters a profession, the individual expects to receive approval and remuneration for the work accomplished (countenance and profit). To receive it, an individual needs to be "a help and ornament." Ornament is a fascinating word. According to Merriam-Webster (2020) one definition for the word "ornament" is "one whose virtues or graces add luster to a place or society." Note the words "add luster." The definition implies that the individual shines brighter than others or reaches "above and beyond." To put Bacon's quote in modern English, he is saying that since every person expects approval and remuneration from their profession, then every person should provide no less than the absolute best that can be offered–beyond the status quo.

Leadership essentially "occurs whenever one person attempts to influence the behavior of an individual or group, regardless of the reason" (Hersey et al., 2001, p. 9). Considering this definition, teacher educators are leaders. As education leaders, teacher educators should constantly look for ways to "change, grow, and improve" (Kouzes & Posner, 2002, p. 22), as such they should provide pre-service teachers a vision of a 21st century classroom. By both profession and leadership, teacher educators are ethically obligated to pre-service teachers to provide a 21st century education so that future teachers enter the classroom as 21st century educators on day one ready to teach today's students.

Rationale

By 2017, educational technology standards existed for groups such as K-12 educators, students, education leaders (administration), and technology coaches, along with an overall category for computational thinking (International Society for Technology in Education, 2017). Though individual standards vary between groups, common subject threads exist such as learning, leadership, digital citizenship, collaboration, design, and analytical thinking. However, teacher educator technology standards did not exist at that time. The lack of teacher educator technology standards presented a salient issue, as two educator preparation organizations expect teacher candidates to receive technology training. The Council for the Accreditation of Educator Preparation (CAEP) expects that "candidates' model and apply technology standards" (CAEP, 2013). Technology is specifically mentioned in three of the five CAEP standards, but also addressed as a cross-cutting theme throughout the CAEP standards. Candidates tend to model what they have experienced in the classroom, in turn teacher educators should model technology standards daily (Kalonde & Mousa, 2016; Slykhuis et al., 2020). The Interstate Teacher Assessment and Support Consortium (InTASC) considers the use of technology a "cross-disciplinary skill" and expects the teacher entering the classroom for the first time to possess these skills (Council of Chief State School Officers, 2013). Multiple content-area standards also possess wording which expects various teacher technology skills and competencies.

The Horizon Report, a technological forecast provided by educational experts for over 17 years (Fuerte, 2019), provides additional evidence for the need of teacher educator technology competencies. The 2019 Higher Education Edition (Alexander et al., 2019), produced for the first time by Educause, examined three areas of technology: "key trends accelerating technology adoption, significant challenges impeding technology adoption, and important developments in

educational technology" (p. 2). The report considers the notable challenges impeding technology adoption in higher education as either solvable, difficult, or wicked challenges. Notably, "improving digital fluency" is one of the solvable challenges (p. 14). The key word is fluency, defined by Merriam-Webster (2020) as "showing mastery of a subject or skill" and not literacy, which is defined as "having knowledge or competence." At this point in the 21st century, teacher educators should already possess digital literacy. The time has arrived to rise to the next level, which is digital fluency. The report considers "rethinking the practice of teaching" as a "wicked challenge" (p. 19). In higher education the focus is slowly shifting from teacher-centered to student-centered, but the work is far from complete.

In 2016, a U.S. Department of Education policy brief emphasized that technology integration throughout a teacher preparation program, rather than a one-time technology class, leads to increased sustained future classroom integration (Stokes-Beverley & Simoy, 2016). Based on a recommendation from the United States National Educational Technology Plan, Foulger, et al. (2017) developed the Teacher Educator Technology Competencies (TETCs) to fill the teacher educators' technology standards gap. Foulger et al. (2017) describes the TETCs as "…the competencies (knowledge, skills, and attitudes) *all* teacher educators need in order to support teacher candidates as they prepare to become technology-using teachers" (p. 413). The twelve competencies, each with multiple criteria, provide a thorough framework by which to examine the teacher educator's technology skills and competencies modeled within a teacher preparation program. The researcher of the present study discovered five themes within the twelve TETCs. Three competencies' theme is TPACK, which stands for Technological Pedagogical Content and Knowledge (Mishra & Koehler, 2006). The Digital Learning theme comprises the three competencies of online tools, assessment, and online learning. The

Technology Leadership theme contains competencies that have never been more relevant than in 2020: diversity, digital citizenship and ethics, professional development, and technology leadership and advocacy. A single competency provides a theme of communication and collaboration. Technology troubleshooting comprises the final theme. Each competency provides teacher educators the opportunity to demonstrate their technological, pedagogical, and content knowledge within the context of their content area. The chapter two literature review provides a more detailed discussion of the TETCs.

Purpose of the Study

The purpose of this qualitative, phenomenological study was to explore how and to what extent teacher educators evaluate, align and demonstrate technology within teacher preparation programs. The Advancing Educational Technology in Teacher Preparation Policy Brief (Stokes-Beverley & Simoy, 2016) states, "Our nation's motivated and committed pre-service teachers deserve to be trained by faculty using technology in transformative ways that thoughtfully support and measure learning gains." As leaders to the future generation of teachers, teacher educators should not only be exemplary models of technology integration in the classroom but also inspire a vision of the 21st century classroom within the teacher candidates, enabling the candidates to duplicate the same skills in their future classrooms. The Society for Information Technology and Teacher Education (SITE) states, "Teacher candidates who receive consistent and appropriate experiences with technology throughout their teacher education programs will be more prepared to integrate technology into their own classrooms" (SITE, 2021). This necessitates that teacher educators teach with technology and teach about technology integration program-wide and program-deep. The Teacher Educator Technology Competencies (TETCs) (Foulger et al., 2017), provide teacher educators with a visionary list of the competencies needed

to address these needs. The present study focused on the first TETC: "Teacher educators will design instruction that utilizes content-specific technologies to enhance teaching and learning" (p. 432). Each of the twelve TETCs includes 2-5 supporting criteria. The first TETC, addressed under the present study's rationale (p. 8), includes three criteria: (a) evaluate content-specific technology for teaching and learning, (b) align content with pedagogical approaches and appropriate technology, and (c) model approaches for aligning the content being taught with appropriate pedagogy and technology. This competency and the accompanying criteria provide the starting point for teaching with technology and for teaching about technology integration. As Mishra and Koehler (2006) state, "…merely knowing how to use technology is not the same as knowing how to teach with it" (p. 1033).

Research Questions

The present study addressed the following research questions, with accompanying sub-question:

1. What are the experiences of teacher educators utilizing technology within a teacher preparation program?
2. How do teacher educators evaluate content-specific technologies for teaching and learning?
3. What approaches do teacher educators use to align content, pedagogy and technology?
    a. How do teacher educators demonstrate this alignment to pre-service teachers and teacher candidates?

Conceptual Frameworks

Technology Integration

The TPACK framework, utilizing a Venn diagram, "attempts to identify the nature of knowledge required by teachers for technology integration in their teaching, while addressing the complex, multifaceted and situated nature of teacher knowledge" (Mishra & Koehler, 2006). As the three types of knowledge (content, pedagogical, and technological) interact, multiple combinations are created, providing a powerful context to a variety of teaching situations. The key in utilizing TPACK and its combinations (pedagogical-content knowledge, technological-content knowledge, technological-pedagogical knowledge, etc.) rests in the educator's understanding of each area and the context of the situation. In 2019, Mishra updated the TPACK model by changing contexts to contextual knowledge (XK), providing additional depth to the framework.

Foulger et al. (2017) developed the Teacher Educator Technology Competencies to fill the gap in teacher educator technology standards. The final competencies provide twelve categories, each with two to five underlying criteria, thereby providing depth to each competency. As discussed previously, five themes are found in the competencies: TPACK, Digital Learning, Technology Leadership, Communication and Collaboration, and Technology Troubleshooting. Each competency provides teacher educators the opportunity to demonstrate their technological, pedagogical, and content knowledge.

Since the publication of the competencies, organizations such as International Society of Technology in Education (ISTE), Society for Information Technology and Techer Education (SITE), Council for the Accreditation of Educator Preparation (CAEP), National Technology Leadership Coalition (NTLC), American Association of Colleges of Teacher Education

(AACTE), and the United States Department of Education (US Ed) have supported the use of the competencies with teacher educators.

Technology infusion represents a program-wide, program-deep technology integrated teacher preparation program in which the teacher educators effectively model technology use and teach technology pedagogy. In addition, pre-service teachers and teacher candidates are provided the opportunity to apply these technological pedagogical content skills, reflect on these skills, and receive feedback for future application (Foulger, 2020). The National Education Plan (Office of Educational Technology, 2017) supports and promotes such a program through its four guiding principles. A teacher preparation program evidences technology infusion when all teacher educators possess the necessary and current technological pedagogical skills for their content area.

Adult Learning and Leadership

Most individuals, upon hearing the word "pedagogy," think of a framework for teaching and learning. The literal meaning of "pedagogy" is "the art and science of teaching children" (Knowles, et al., 2015). This was the education standard for centuries, even for adults. The pedagogical framework allows the teacher to make the decisions for the learner. As adult education programs grew in the 20th century, so did adult development theories, also known as andragogy. Ultimately in the late 20th century, Malcolm Knowles developed the primary andragogical framework used today, which contains the following six principles (Knowles, 1970):

1. Learner's need to know
2. Self-concept of the learner
3. Prior experience of the learner

4. Readiness to learn
5. Orientation to learning
6. Motivation to learn

The andragogical framework changes the focus by turning it to the learner, which begins with the learner's need to know why, what, and how. With this change in setting, the teacher role transitions to a facilitator role, evidenced by increased two-way communication and guidance with the student. At the very start of the learning process, the facilitator (formerly known as the teacher) should communicate with the adult learners the answers to the three questions, why, what, and how. The facilitator should also become familiar with the adult learners and attempt to discover their prior experiences (number three in Knowles' model), which provides the adult learners as possible resources and models during the learning process. Consider this andragogical setting for teacher educators whose professional learning is a continual, life-long process. The need for continual professional learning and competency is made increasingly evident by the 21st century school environment (Slykhuis et al., 2020; Wagner & Dintersmith, 2015). Professional learning development should focus on the learner, in this case teacher educators, and their specific needs. Taking into consideration the teacher educator's needs can positively affect the readiness to learn (Knowles' step four), the orientation to learning and the motivation to learn (Knowles' steps five and six), which encompasses Knowles' framework.

Knowles' andragogical framework intersects with Kouzes and Posner's Five Practices of Leadership (Kouzes & Posner, 2002), which are (a) model the way, (b) inspire a shared vision, (c) challenge the process, (d) enable others to act, and (e) encourage the heart. This intersection of frameworks is particularly useful in higher education not only as administration leads a teacher educator team, but also as teacher educators lead the teacher candidates. As the

administrative leadership "models the way" to the teacher educator team the why, what and how (Knowles first step) provides motivation (Knowles step six) and "inspires a shared vision." Entrepreneur and author, Seth Godin, provides this insight: "The secret of leadership is simple: Do what you believe in. Paint a picture of the future. Go there. People will follow" (Sheninger & Murray, 2017). Godin's statement blends *model the way* and *inspire a shared vision*. If leaders do what they believe in (modeling the vision), people will follow (inspiring others with the same vision).

When teacher educators see administration model the organization vision, it inspires a motivation to "change, grow, and improve" (Kouzes & Posner, 2002, p. 22), thereby challenging the process. When dealing with educational technology, the landscape continually changes. The 20th century skills (reading, writing, arithmetic) are now replaced with the 21st century skills of critical thinking, communication, collaboration, and creative problem-solving (Wagner & Dintersmith, 2015, pp. 223-224). Therefore, teacher educators need to evidence the change, growth, and improvement in their 21st century skills that they model to teacher candidates.

Adult learning, leadership, and organizational change are all areas of consideration when discussing teacher educators' professional learning. Professional learning, as previously discussed, needs to meet the needs of the individual and of the organization. The generic, one-size-fits-all, top-down professional development does not meet the 21st century educator's needs, either in topic or time or enabling teacher educators to acquire the desired skills or competencies. Various models exist for professional learning. Parrish and Sadera (2019) researched three models which they considered favorable for professional learning: mentoring, mutually beneficial partnerships, and communities of practice, also known as professional learning communities (Paulus et al., 2020). Lesson Study (LS), a type of community of practice,

traditionally conducted in-person found its way to an online format due to the COVID-19 pandemic (Weaver et al., 2021). Recent years have seen the development of micro-credentialing, also known as digital badges. Micro-credentialing provides educators the means to personalize the content based on their needs, interests and current abilities within the time constraints prevalent within education (Gamrat et al., 2014). Foulger et al. (2017) referenced micro-credentialing, among other professional learning possibilities, during the conclusion of the TETCs.

Methods

Phenomenological research was conducted to discover the experiences of teacher educator's utilizing technology in teacher preparation programs. Using purposive sampling, teacher educators were selected for participation in this qualitative study. Data collection came from face-to-face interviews of teacher educators, providing rich and descriptive data (Maxwell, 2013). The data analysis provides teacher educators and school leadership a window into the experiences of teacher educators' technology use within TPPs. These indicate where gaps may or may not exist, which could be filled through future professional learning and leadership. This also provides teacher educators an opportunity to reflect on their use of technology within the classroom (Slykhuis et al., 2020).

Significance of the Study

The exploration of how and to what extent teacher educators evaluate, align and demonstrate technology within teacher preparation programs has practical relevance for teacher educators and TPP administration in the development of teacher educators' professional learning. It also provides teacher educators a means to contemplate on and develop further their technology skills and competencies. This may include setting professional learning goals focused

on incorporating additional technology contextually aligned with the appropriate content and pedagogy. Funding allocations for professional development may be increased if the such a need is revealed to TPP administration. Pre-service teachers and teacher candidates may change how they teach based on how they are taught by teacher educators.

Delimitations and Assumptions

The researcher assumed the information provided by those participating in research was accurate. The researcher assumed any artifacts submitted by a teacher educator as part of the research was the teacher educator's own work.

Definition of Terms

Preservice Teacher

Individuals in undergraduate programs seeking initial teaching licensure

Teacher Candidate

Individuals in undergraduate programs who have completed the requirements to begin the student teaching program

Teacher Educator

Individuals who teach in higher education undergraduate teacher preparation programs

Teacher Educator Technology Competencies

A set of twelve technology competencies, designed in 2017, specifically for use by teacher educators

Teacher Preparation Program

The undergraduate program during which pre-service teachers and teacher candidates receive training within the classroom and in the school setting to receive licensure as an in-service teacher.

Technology Infusion

A *program-wide, program-deep* technology integrated teacher preparation program in which the teacher educators *effectively* model technology use and teach technology pedagogy

Technology Integration

The use of *readily available* technology resources to enhance student learning by *achieving the goals and objectives* of the curriculum. Students *actively*, rather than passively, *learn*, providing an *engaged learning environment*. In a classroom truly utilizing technology integration, teacher and students use technology as *naturally* as they use a pencil.

Organization of the Study

An introduction to the need for teacher educators to possess technology competencies as well as its importance throughout teacher preparation programs, has been presented. The background of the problem, rationale, purpose of the study, frameworks, and an introduction to the methods have been introduced. Lastly, significance of the study, delimitations, assumptions, and definitions of terms have been presented in Chapter 1. The remaining chapters include: Chapter 2, a thorough review of the existing body of literature; Chapter 3, the framework of the methodology for the study; Chapter 4, the results of the phenomenological research; and Chapter 5, conclusions and recommendations for future research and policy implications.

CHAPTER 2: LITERATURE REVIEW

To embrace the need for teaching about technology and with technology within a teacher preparation program (TPP), teacher educators and teacher preparation program (TPP) administration need to recognize the elements that encompass a 21st century classroom. Educational frameworks, methodologies, and standards now include a technological element. As "gatekeepers" to the next generation of teachers, teacher educators greatly influence their students, yet find difficulty including technology (Tondeur, et al., 2019). A key factor toward a teacher educator's 21st century skill development is the educator's acceptance of technology (Marangunić & Granić, 2015). Teacher educators' professional learning needs to consider not only andragogical principles (Knowles et al., 2015), but also principles of the adult generational mix (Holyoke & Larson, 2009). Professional learning for the 21st century has transformed into interactive, hands-on training, which can present itself in the form of learning communities, lesson study groups, and micro-credentialing (digital badging), to name just a few.

Transformational organizational change requires that, first and foremost, TPP administration is on board and leading the way (Burke, 2018; Clausen, 2020; Fullan, 2011; Kouzes & Posner, 2002). Transformational leaders know the individuals with whom they work, what motivates them, and understand how they learn. The TPP administration's vision and sustaining support of such transformational change for teacher educators establishes a strong indicator of the success (Clausen, 2020). This support enables continuation of the program changes, a critical juncture in the change process, beyond the initiation and implementation stages (p. 177).

This literature review analyzes two frameworks that aid in creating a 21st century digital classroom. The exploration of teacher educators' learning process includes the areas of

andragogy, the adult generational mix, the Technology Acceptance Model, and professional learning. The elements of leadership and organizational change are examined as necessary supports. With the need established, the phenomenological research approach and methodology is discussed in chapter 3.

The 21st Century's Digital "Pencils in a Classroom"

The 21st century classroom examination necessitates considering the factors that affect the transformation of various technological tools into the 21st century's digital "pencils in a classroom." In today's classroom when a teacher requires a student to use a pencil, a student knows how to access a pencil and use it for the assignment. If the pencil needs sharpening, the student knows how to sharpen it. If a pencil mark needs erasing, this task is also easily accomplished by the student. The student has learned since kindergarten or before how to hold the pencil, write with the pencil, erase with the pencil, and sharpen (or maintain) the pencil. This same level of ease of use is the goal for digital tools in the 21st century classroom. Students learn how to appropriately utilize these tools from kindergarten through high school, throughout all subjects, including maintaining or troubleshooting. To reach such a goal requires more than a 1-on-1 program in a school. Multiple frameworks, taxonomies, and standards exist to guide administrative leadership and educators to the goal of digital tools utilized as "pencils in the classroom."

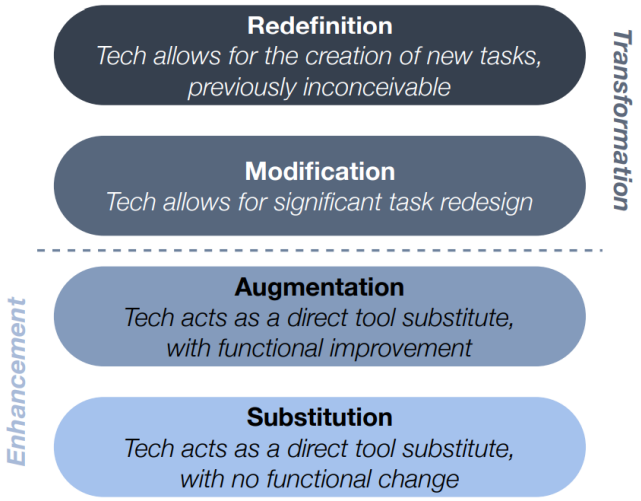
The SAMR Model

The SAMR model (substitution, augmentation, modification, and redefinition) was developed in 2009 to identify the depth of technology integration (Puentedura, 2020). The four levels represented in the SAMR model are divided into the two levels of enhancement and

transformation, as demonstrated in Figure 1. The enhancement level includes the first two levels of SAMR, substitution and augmentation.

Figure 1

SAMR Model



Note: Graph from SAMR - A research perspective by R. R. Puentedura, January 2020, http://hippasus.com/rrpweblog/archives/2020/01/SAMR_AResearchPerspective.pdf

Creating a document in Microsoft Office Word is an example of substitution. Word acts as a direct tool substitute compared to writing the document manually. Augmentation would see this same assignment utilizing online research or citation sources. In both cases, technology has enhanced the task, but transformation has not yet occurred. In the next level, transformation will provide significant modification and even creation of new tasks (redefinition). For the modification stage, the document could be written in the cloud as an Office 365 Word document or as a Google Doc. While the document is written, class peers provide asynchronous or synchronous comments to the document. The key to the fourth level of redefinition is creating

new tasks not possible without technology utilization. Using this same example, this task could be redefined by utilizing a student blog or website. The student is still implementing writing skills, but instead of a one-on-one audience between student and teacher, there is potential for student collaboration from around the world. This is task redefinition.

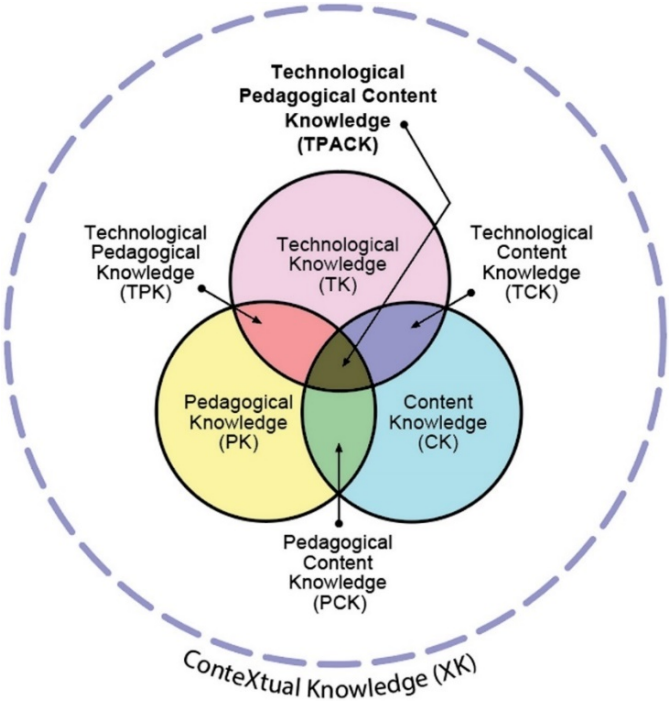
Utilizing SAMR provides a tool for educators to recognize the depth of technology use. Prior to the use of technology in the classroom, educators need a framework that brings together the technological, pedagogical, content, and contextual components. TPACK supplies educators with such a framework.

The TPACK Framework

Following five years of research, Mishra and Koehler (2006) presented a theoretical framework for educational technology called TPACK, which represents technological, pedagogical, and content knowledge (Figure 2). The authors used Shulman's "pedagogical content knowledge" and expanded it by adding technological (technology integration). Content knowledge (CK) is subject matter knowledge. Pedagogical knowledge (PK) focuses on methods of teaching and learning (p. 1026). Prior to the authors' research, content knowledge and pedagogical knowledge were viewed separately. Combining the two creates pedagogical-content knowledge (PCK), possessing the knowledge in which the appropriate teaching and learning methods, skills, or processes are appropriate for the desired content.

Figure 2

TPACK Framework (Revised)



Note. Revised version of the TPACK image. © Punya Mishra, 2018. Reproduced with permission.

Technological knowledge (TK) requires not only knowing current standard technologies, but also keeping apprised of the latest educational technology developments (Mishra & Koehler, 2006). This new knowledge area creates three additional areas: technological content knowledge (TCK), technological pedagogical knowledge (TPK), and technological pedagogical content knowledge (TPCK or TPACK). Technological content knowledge (TCK) reveals the mutual and complementary relationship between technology and content. An educator's knowledge of and ability to choose the best technology tools for teaching evidences technological pedagogical

knowledge (TPK). With both TCK and TPK an educator realizes that content or teaching may change because of technology implementation (p. 1028).

Content knowledge, pedagogical knowledge, and technological knowledge (TPACK) combined equate to more than knowing the subject, pedagogy and technology. Mishra and Koehler (2006) state:

> TPACK is the basis of good teaching with technology and requires an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face; knowledge of students' prior knowledge and theories of epistemology; and knowledge of how technologies can be used to build on existing knowledge and to develop new epistemologies or strengthen old ones. (p. 1029)

This viewpoint of TPACK also reveals the importance of context. No methodology or framework will function exactly the same in every situation. Context needs to be considered.

Porras-Hernández and Salinas-Amescua (2013) developed three levels of context: macro, meso, and micro. They also purported that TPACK be viewed not only from the teacher's viewpoint, but also the student's viewpoint. They further submit that context should be considered an additional knowledge area in the TPACK framework. In 2019 Mishra stated the benefits of adding contextual knowledge to the framework which included knowledge of available technologies and knowledge of applicable education policies. He went on to state that lack of contextual knowledge can hinder the effectiveness of TPACK. With this mind the TPACK was updated, changing what was formerly "context" to "contextual knowledge" (XK).

The TPACK framework has provided the impetus for numerous publications in various formats since 2009. A Google scholar search today for publications with TPACK in the title produced over 4,200 results. Frequently cited among those publications is the work of Schmidt et al. (2009). The study focused on the development of a survey instrument to measure the pre-service teachers' self-assessment of TPACK. TPACK's seven domains provided the framework for the survey, which consist of technological knowledge (TK), content knowledge (CK), pedagogical knowledge (PK), pedagogical content knowledge (PCK), technological pedagogical knowledge (TPK), technological content knowledge (TCK), and technological pedagogical content knowledge (TPACK). The research team used an iterative approach to develop the survey questions followed by expert content validity analysis. The final survey resulted in 75 Likert style questions. The questions provided 5 response levels ranging from "strongly disagree" to "strongly agree."

The 124 study participants were all students in an introductory educational technology course at the same university, whose major was elementary or early childhood education and whose content area was either literacy, mathematics, science, or social studies. The researchers used Cronbach's alpha and factor analysis for each of the 7 domains. The results show an instrument with reliability and validity in measuring the pre-service teachers' self-assessment of TPACK. Future research was recommended with a larger sample, other content areas, and other levels (e.g. secondary). Since its creation, this instrument has been utilized in numerous studies, either modified or in its original form, as well as cited nearly 1,900 times.

Voithofer et al. (2019) examines the level of TPACK adoption as well as the individual and institutional characteristics that guide TPACK use by teacher educators. The research's relevancy relates to the recent release of the Teacher Educator Technology Competencies

(TETCs) (Foulger et al., 2017). Multiple TETCs find their beginnings in the TPACK concepts. Additionally, the Council for the Accreditation of Educator Preparation (CAEP) includes TPACK concepts throughout the CAEP standards.

Through an online survey of 842 teacher educators spanning over 500 different institutions from each of the 50 States, the researcher focused on teacher educators in the core subjects of science, mathematics, and English/language arts, plus the topic of educational technology (Voithofer et al., 2019). The survey comprised three sections, of which the first two were demographic information and the technology integration experiences of teacher educators on a personal and institutional level. The third section was an adaptation of an instrument developed for pre-service teacher's self-assessment of their TPACK skills (Schmidt et al., 2009). Utilizing the instrument's technological knowledge (TK) and TPACK sections, it was modified for teacher educator use.

Following data collection, descriptive statistics and regression analysis were employed. Regarding overall TPACK adoption, 38% (n = 283) indicated TPACK adoption, 30% (n = 229) did not indicate TPACK adoption, and 32% (n = 242) stated not knowing about TPACK (N = 754) (Voithofer et al., 2019). High levels of technological knowledge (TK) by a participant did not by itself indicate whether a teacher educator will use TPACK. However, a teacher educator who is technology-confident, willing to experiment, or troubleshoot with technology is more likely to adopt TPACK. A strong indicator of a teacher educator's TPACK adoption is embracing the ISTE standards. Additionally, teacher educators TPACK adoption and the number of years as a K-12 teacher showed statistical significance. Institution size and type did not affect TPACK adoption. The teacher educator's perceptions of support by the institution can influence their technology implementation.

Though the study's sample was large, the study states that it is not comprehensive and additional research needs to be conducted. The evidence that over 60% of the teacher educators surveyed either have not adopted or are not aware of TPACK warrants further research. The TPACK language is evident through the CAEP standards and TETCs, both important factors for teacher preparation programs. TPACK adoption does not occur through a single indicator but is a reciprocal process of multiple indicators.

A qualitative study from South Africa examined 8 teacher educators' technology use through the lens of TPACK and SAMR (Tunjera & Chigona, 2020). The researcher asserts that TPACK, which focuses on the educator's knowledge of technology, pedagogy, and content, should be studied in light of SAMR, which focuses on the level of technology integration and more towards the student. Examining technology integration through both lenses provides a view of both the behaviorist and constructivist theories. The researcher premise is that by a joining of the TPACK and SAMR frameworks, teacher educators can provide a more student-centered approach to teaching with technology.

The case study used one-on-one interviews and non-participant observations. The participants were teacher educators from the same university in South Africa. An email was sent to 63 teacher educators, of which 22 indicated interest in the study. The participants were purposely selected based on their current classroom technology use. Ten individuals were identified as possibly participants and 8 accepted. Each of the 8 teacher educators participated in a one-on-one interview that included open-ended questions. In addition, 4 teacher educators were observed in their classrooms seven times until no new information was noted. The researcher organized the data based on the participants' views of teacher preparation programs. The next step was coding the interview transcripts and observation notes using TPACK and SAMR for a

comparison. During this process the researcher wrote concept memos based on the insights acquired through the data analysis.

Four themes were discovered through the data analysis: technology mediated teaching strategies; content specific instructional technology; professional development and educational technology; and TPACK-SAMR in the pre-service teacher preparation. The technology mediated teaching strategies theme revealed that teacher educators tend to utilize technology at the substitution or augmentation (enhancement) levels and rarely achieve modification and redefinition (transformation) levels. Content specific instructional technology relates to the Technological Content Knowledge (TCK) of the TPACK framework. The research found teacher educators using content specific technology for tutorial instruction, simulations, and technology-enhanced drill and practice. Though teacher educators saw advantages in the use of these technologies, generally these uses only reach the SAMR enhancement level of either substitution or augmentation. Additionally, teacher educators made statements regarding non-functioning technology, which indicates a need for institutional support to maintain the available technologies.

The third theme of professional development revealed that teacher educators felt professional development lacked relevance and a hands-on component. Professional development needs to not only address these needs but also consider the various learning styles and current level of the teacher educators' technological knowledge. In the final theme the researcher explores the teacher educators' TPACK knowledge and adoption. The data shows that teacher educators are using the TPACK framework to guide and achieve their learning goals. However, the lack of technological knowledge (referencing theme 3) results in technological integration reaching only the substitution or augmentation levels of the SAMR model.

The significance of this research reveals that teacher educators are utilizing technology, but simply inserting it into "existing traditional structures," rather than reaching for the transformational alternatives that technology can provide (Tunjera & Chigona, 2020, p. 137). Relevant, hands-on professional development accounting for the teacher educator differences may also improve the technology integration levels. Additionally, institutional support is vital in starting and maintaining organizational changes at every level.

The Mary Lou Fulton Teachers College of Arizona State University provides an effective example of technology integration within a teacher preparation program. In 2011 student teaching expanded, resulting in the elimination of the stand-alone educational technology course (Foulger et al., 2019). Over the next several years, the educational technology faculty implemented a program that integrated the educational technology curriculum within the methods courses. During the program's implementation several research studies documented the work accomplished by the program.

Reflecting on the program's accomplishments, the educational technology faculty provides three factors that affected the technology integration at their College. It is important to note that the first factor is administrative leadership and support, which involved resources, personnel, and administrative backing. The second factor of dedicated professional development could not be effective without factor one. Initially a professional development specialist was hired with an additional one added some time later. Working with course coordinators, the specialists helped in areas such as syllabus re-design and lesson samples, which eventually expanded to all instructors. The sustaining efforts comprised the last factor. Continual reviewing and reflecting on the work accomplished assisted in steady improvements.

Foulger et al. (2019) also offer several considerations for other teacher preparation programs before beginning a technology infusion program. These include: personalized vision, dedication, leveraged circumstances, leadership capacity, role of educational technology faculty, sustained effort, minimize professional development needs, plan for extensive and ongoing professional development, expect pushback from students, and account for a decline in student satisfaction (pp. 86-88). They also encourage other teacher preparation programs to examine the contextual considerations. The authors conclude that their College benefited from such a tech integration program but that more research is needed in other teacher preparation programs.

To achieve the 21st century Digital "Pencils in the Classroom," teacher educators should implement frameworks such as TPACK. Contextually utilizing technological, pedagogical, and contextual knowledge, teacher educators can teach with and about technology to pre-service teachers and teacher candidates, providing them with similar skills. These future teachers will then enter their classrooms ready to show their students how to appropriately utilize the 21st century Digital "Pencils in the Classroom."

Teacher Educator Technology Experiences

As previously discussed, the 21st century classroom necessitates a technology-infused atmosphere that enhances and promotes active student learning, which would include teachers that possess and demonstrate such skills. Even though standards from a cross-section of organizations, such as NCATE and InTASC, encourage, promote, and provide guidelines for such technology-infusion, new in-service teachers are entering the classroom without these technology skills. The teacher educators' multi-faceted responsibility as educators, leaders, and mentors to teacher candidates is to provide the technological, pedagogical, and content knowledge within the proper context to create a 21st century classroom. Understanding this

multi-faceted responsibility includes examination of its contributing factors, which include the necessary technological knowledge and skills, adult development and learning, technological attitudes and beliefs, and professional learning.

Teacher Educator Technology Competencies

Teacher preparation programs should provide technology integration throughout the width and depth of the program (Stokes-Beverley & Simoy, 2016). Within a teacher preparation program single technology integration classes, whether in a general context or within a specific subject, do not demonstrate to teacher candidates the 21st century classroom vision. To fill the teacher educator technology competency gap, support teacher educators in their professional learning, and guide TPP administration in program development, the Teacher Educator Technology Competencies were created (Foulger et al., 2017).

Using a collaborative process, three phases were utilized in creating the competencies: crowdsourcing, the Delphi method, and public comment. Crowdsourcing provided an article library focusing on teacher educators. Ninety-three articles were reduced to 43 in order to utilize articles that were specific to teacher educators. From the final 43 articles, the research team developed 31 competencies, which were then reduced to 24 competencies. Seventeen educational technology experts participated in the six-stage Delphi method. Within the first three rounds, the competencies were reduced to 13. The accomplishment of the next two rounds produced criteria for each competency. The final round decided on a logical order for the competencies. The public comment phase asked questions regarding what aspects were most useful, how the TETCs could be used, concerns about the TETCs, and any additional comments (Foulger et al., p. 430). The final Teacher Educator Technology Competencies are visible in Table 1.

Table 1

Teacher Educator Technology Competencies

1. Teacher educators will design instruction that utilizes content-specific technologies to enhance teaching and learning.
2. Teacher educators will incorporate pedagogical approaches that prepare teacher candidates to effectively use technology.
3. Teacher educators will support the development of the knowledge, skills, and attitudes of teacher candidates as related to teaching with technology in their content area.
4. Teacher educators will use online tools to enhance teaching and learning.
5. Teacher educators will use technology to differentiate instruction to meet diverse learning needs.
6. Teacher educators will use appropriate technology tools for assessment.
7. Teacher educators will use effective strategies for teaching online and/or blended/hybrid learning environments.
8. Teacher educators will use technology to connect globally with a variety of regions and cultures.
9. Teacher educators will address the legal, ethical, and socially-responsible use of technology in education.
10. Teacher educators will engage in ongoing professional development and networking activities to improve the integration of technology in teaching.
11. Teacher educators will engage in leadership and advocacy for using technology.
12. Teacher educators will apply basic troubleshooting skills to resolve technology issues.

Note. Complete Teacher Educator Technology Competencies with criteria are available in Appendix A. Adapted from Foulger, T. S., Graziano, K. J., Schmidt-Crawford, D. A., & Slykhuis, D. A. (2017). Teacher Educator Technology Competencies. *Journal of Technology and Teacher Education, 25*(4), 413-448. https://www.learntechlib.org/primary/p/181966/

Each competency provides teacher educators the opportunity to demonstrate their technological, pedagogical, and content knowledge, skills, and attitudes within their educational context. The competency criteria create a scaffold for teacher educators to explore and build on their knowledge, skills, and attitudes. Action words such as evaluate, model, reflect, support,

collaborate, design, demonstrate, guide, and engage, evidence competencies created to engage teacher educators to model a 21st century classroom to the future teachers under their guidance (Foulger et al., 2017).

The public comment phase included multiple suggestions for the TETCs use including assisting in course design, developing a self-assessment tool (Foulger et al., 2017), and overwhelming support for advancing professional learning. Mentoring was emphasized to promote professional learning. Digital badging was suggested to promote a teacher educator's technology competency. The TPP administration support is another key element in the successful implementation of the TETCs (Clausen, 2020). As earlier stated, a concerted effort that is program wide and program deep is necessary for success. Currently six organizations endorse the Teacher Educator Technology Competencies.

Knezek and Christensen (2019) developed the Teacher Educator Technology Competencies Survey, a self-reported 12-item Likert-style validated instrument. The 223 participants were a convenience sample of teacher educators at the Society for Information Technology and Teacher Education (SITE) Conference (n = 83) and teacher educators (n = 140) from twelve universities covering three continents. Utilizing Cronbach's Alpha, the 12 survey items were found very reliable at .95. The lowest averaged item was "use technology to connect globally with a variety of regions and cultures" (M = 3.83) in contrast with the highest item of "use online tools to enhance teaching and learning" (M = 4.32). The overall mean on a scale of 1 to 5 was 4.08. Three subscales of instructional practices, teacher preparation, and appropriate uses were also found with very good reliability. The veracity of the subscales and the survey instrument strengthen the validity of the TETCs. The survey instrument has the opportunity for both individual and TPP professional learning.

Various studies attempting to integrate technology, either within a course or program wide, reference the TETCs (Dillon et al., 2019; Segal & Heath, 2020; Thomas et al., 2019). Parrish and Sadera's research (2019) regarding faculty development models and the TETCs will be reviewed later in this chapter. With the establishment of the TETCs visionary list of skills and competencies, teacher preparation programs have the opportunity to develop their teacher educators to teach with and about technology in order that pre-service teachers and teacher candidates receive the training necessary to enter their future school prepared for the 21st century classroom.

Andragogy

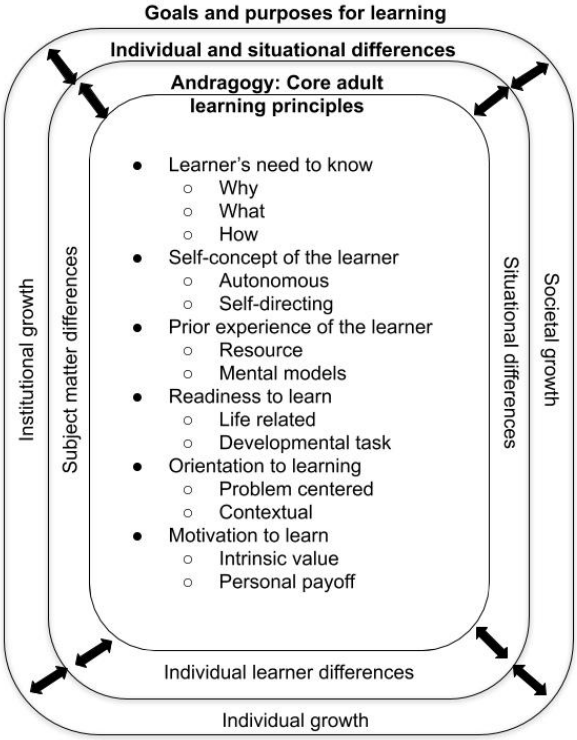
A difference exists in the learning of children and the learning of adults, known as andragogy. Malcolm Knowles, in the seminal work on andragogy, *The Adult Learner* (Knowles, et al., 2015), states that even in ancient times the great teachers "perceived learning to be a process of mental inquiry, not passive reception of transmitted content." Four generally accepted definitions of an adult exist: biological (age of reproduction), legal (by law), social (performing adult roles), and psychological (self-concept of responsibility), which is considered most important when considering learning methodology (Knowles, et al., 2015, p. 46). Knowles andragogical model applies as individuals reach an adult level psychologically.

The two outer rings encompass the six core adult learning principles (see Figure 3). The outer-most ring contains the three goals and purposes for learning: institutional growth, societal growth, and individual growth. The outer ring's goals and purposes evidences through teacher educator professional learning. Teacher educators' individual growth not only benefits the individual teacher educators, but also benefits the institution when the teacher educators provide a deeper and richer experience to the teacher candidates. The domino effect manifests through

societal growth as teacher candidates enter the classroom ready to integrate technology to enhance active student learning and enrich the student experience.

Figure 3

Knowles Andragogy in Practice



Note. Adapted from Knowles et al. (2015).

The inner ring represents individual and situational differences, such as subject-matter differences, situational differences, and individual-learner differences (Knowles, et al., 2015, p. 79). The complexity or unfamiliarity of subjects can create a roadblock for self-directed learning. Situational differences change the learning strategy as well, such as large group, person-to-person, or online. The events of 2020 and the advent of the COVID-19 pandemic provides a present-day example of situational differences. Classrooms were thrust into an online learning

environment, whether or not the educators or students were ready. Most teachers' strategy changed overnight. Even if subject matter and situational differences are met, one cannot disregard individual differences. Every individual is different, not only in age, but learning style. Both issues will be addressed later by Holyoke and Larson's research (2009) regarding the adult generational mix.

The model center contains the six principles of andragogy. The first principle is "the need to know" or the "why, what, how." Learning necessitates relevancy. Without relevancy the adult learner will lack desire, interest, and motivation to learn. "The learner's self-concept" is the second principle in the model and demonstrates the learner's desire to direct one's own learning. This desire is the locus to self-directed learning. Adults frequently lack development in this area, still desiring specific direction from a teacher, more in line with pedagogical principles. Principle three, "the role of the learner's experiences," provides several facets to the andragogical model. Instructors of adults need to remember that individuals have a lifetime of experiences, both positive and negative, to influence the educational experience. The learner's lifetime of experiences has built the learner's character and if the learner feels it is not acknowledged, learners feel discarded.

The year 2020 exemplified principle four, "readiness to learn." Simply stated it means that an adult learns what they need to know when life requires them to know it. The beginning of the year began with the COVID-19 pandemic ascending on the world. By the spring most schools dismissed temporarily or for the semester. Educators across the nation, who had not previously dealt with an online classroom scenario, suddenly found themselves thrust into an unknown world. COVID-19 was the impetus which required them to learn specific skills; the "readiness to learn" was necessitated by life experiences. The continued learning required of

these educators embodies principle five, "orientation to learning." The educators may have been told for years that the need exists to learn online skills, but until the pandemic arrived, many did not see a real-life need for it. The life-centered, real-time application of the skills distinguished this experience from past experiences. The last principle, motivation, can be internal or external. Internal motivators (e.g. self-esteem, quality of life) are stronger than external (e.g. administration, job security). However, both external and internal factors present themselves as obstacles to motivation.

Adult Generational Mix

Individuals dealing with professional learning, whether the leadership requiring it or the individuals developing it, need to consider the adult generational mix and each generation's characteristics (Holyoke & Larson, 2009). Baby Boomers (born between 1943-1960), Generation-X (born between 1960-1980; often called Gen-X), and Millennia (born between 1981-2002; often called Millennials) are the three adult generations currently active within today's workforce. Utilizing Knowles' andragogical model, Holyoke and Larson compared the readiness to learn, the orientation to learning, and the motivation to learn of the three generations. Table 2 provides a summary of each generation and a comparison of the andragogical characteristics. The participants in Holyoke and Larson's study consisted of 30% Baby Boomers, 50% Gen-X, and 20% Millennials.

Table 2

Characteristics of Adult Generational Mix and Knowles' Framework

Characteristics	Readiness to Learn	Orientation to Learning	Motivation to Learn
Baby Boomers **"Traditional" homes; both parents in workforce; children of the Vietnam War; growth of technology**	Ready to learn if materials were relevant and delivered traditionally	"Joy of discovery and self-gratification"	Expression of competence through activities provides motivation
Gen-X **"Latchkey kids"; increase in divorce rates; Cold War; technology explosion; self-reliance; desire for family-work balance**	Felt ready to learn; desire to connect learning to everyday life	Purposeful connections to class elements (other students, class contents, etc.) provide orientation	Motivation occurred during interaction; lack of interaction decreased motivation
Millennials **Family-focused; grew up with technology**	Lacking in curiosity or a "specific need to know"	Student disengagement created by irrelevant material	Depends on instructor or other external factors for motivation; little or no internal motivation

Note. Adapted from Holyoke, L., & Larson, E. (2009). Engaging the Adult Learner Generational Mix. *Journal of Adult Education, 38*(1), 12. https://search.proquest.com/docview/204489438

Today's teacher educators exist in all three generations. As teacher educators of the Baby Boomer generation approach retirement, providing relevancy along with traditional delivery creates the greatest challenges for these individuals who have so few years left training teacher candidates. The Millennial teacher educators' lack of motivation presents the greatest hurdle for this generation. The fact that this generation grew-up with technology may add to this lack of motivation. An assumption (however false) that teacher candidates already possess the needed technology skills leads to little or no additional skills provided in the classroom. Based on Holyoke and Larson's (2009) research, Generation-X teacher educators seem the most likely to provide the educational technology skills to the teacher candidates. With a desire to learn and connect to everyday life and their students, the Generation-X teacher educators' readiness to learn is ever-present and ready to share with the future generation of teachers.

Administration may find it useful to utilize the guidelines provided by the generational mix. Professional learning developed based on generational and individual needs tend to produce more lasting results than a one-size-fits-all style of professional learning. A teacher educator's technology acceptance level may also impact technology competency.

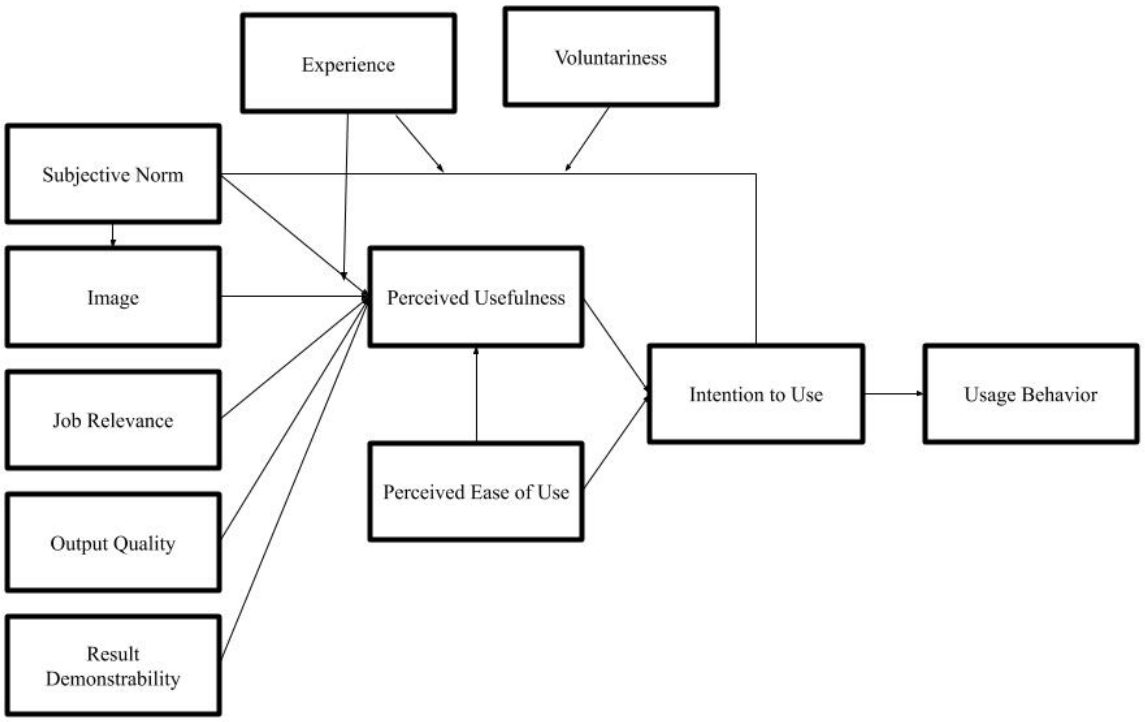
Technology Acceptance Model

Over 25 years ago, Fred Davis developed the Technology Acceptance Model (TAM) based on two psychological theories: theory of reasonable action (TRA) and theory of planned behavior (TPB) (Marangunić & Granić, 2015). The TAM's purpose is to evaluate the factors affecting an individual's technology use. The TAM's key components originally comprised perceived ease of use, perceived usefulness, external variables, attitude toward using, and potential system usage. As Davis continued TAM development, specific factors affecting the perceived usefulness were added such as subjective norm, image, job relevance, output quality,

and result demonstrability. In addition, the "attitude toward using" was altered to the more encompassing statement "intention of use." The updates created the TAM 2 model, demonstrated in Figure 4 below.

Figure 4

Technology Acceptance Model 2



Note. Adapted from "Technology Acceptance Model: A Literature Review," by N. Marangunić and A. Granić (2015). *Universal Access in the Information Society, 14*, 81-95 (https://doi-org.exproxy.bgsu.edu/10.1007/s10209-0140348-1).

Marangunić's and Granić's (2015) examination of the Technology Acceptance Model encompassed an 85-article literature review from 1986 until 2013. Three categories developed from the literature review: TAM literature reviews, TAM development and extension, and TAM

modification and application (p. 81). Throughout the literature, evidence indicates the growth of the TAM through added variables and external factors that affect the perceived usefulness of technology. Anchors and adjustments, which are the beliefs one holds about computers and beliefs shaped by direct experience, were a key addition by Venkatesh (2000). The anchors and adjustments addition provide another consideration as one proceeds through the TAM to actual system usage. TAM model modifications composed four categories: external predictors (technology anxiety, self-efficiency, etc.); validity factors from other theories; contextual factors (gender, cultural diversity, etc.); and usage (actual usage of technology, attitude toward technology) (Marangunić & Granić, 2015).

TAM has experienced numerous changes and additions through the years, yet still offers broad applicability to many fields, including education (Cheung & Vogel, 2013; Farahat, 2012; Gong, et al., 2004; Huang, et al., 2007; Park, et al., 2008; Zhang, et al., 2008). The factors added to perceived usefulness provide insight to a teacher educator's potential technology use. Subjective norm, the influence others provide to the potential technology use, is evident through leadership, both administration and other educators. Job relevance creates an interesting perspective. If teacher educators do not understand the technology use, the job relevance may not be evident. Experience could extend to the area of job relevance, though not actually in the TAM 2 model. Output quality and result demonstrability connect as technology will not be utilized if it does not perform the expected tasks to produce the necessary results. Cultural differences, age, and gender provide future areas of research in which the authors note is particularly relevant to education (Marangunić & Granić, 2015).

Professional Learning

The Office of Educational Technology in its 2016 annual report provides four guiding principles for teacher preparation. One principle references professional learning, stating that higher education schools should "build **sustainable, program-wide systems of professional learning** for higher education instructors to strengthen and continually refresh their capacity to use technological tools to enable transformative learning and teaching" (Stokes-Beverley & Simoy, 2016, p. 9, emphasis supplied). Professional learning has grown from the one-time workshop into personal learning communities, lesson study groups, micro-credentialing, and numerous other options. The following discussion presents a few of these new professional learning possibilities.

In their research, Hogg and Yates (2013) immediately point to the multi-faceted aspect of teacher educators: they not only teach, but also are simultaneously modeling the same skills. The researchers' unique self-study utilized two classes of 178 student teachers that were traditionally taught as lecture-style. The study purpose was to not only model a variety of teaching models within these two classes, but afterward to utilize critically reflective practice. Data collection included rough drafts of lectures, videotaping of the live lectures, and observing each other's lectures periodically. Each one of these areas included feedback from the opposite teacher/researcher. In addition, Hogg and Yates collected the perceptions of the student teachers through interviews for additional feedback. Triangulation provided rich data for analysis. Even though the teachers felt generally positive effects from their modeling (seen from their reflections), when viewing the videos, what actually occurred during class would not necessarily correlate with their reflection. Analysis of the student interview data also revealed mixed results, but still offered comments of benefit to the researchers, such as covering material too quickly,

benefits of in-class activities, needing additional time for practice, and the variety of teaching models exhibited during class. Overall, this study provides an example of the benefits of modeling in teacher education programs. If a change is determined, methodical and reflective practice can assist in accomplishing these goals.

A key issue for professional learning approaches for teacher educators is that they do not fit the model normally seen in a K-12 setting. With this in mind, Otero et al. (2005) utilized a case study design with mediated action, situated learning and learning communities in order to provide a framework for teacher education faculty to utilize effective classroom technology to reach beyond the technology integration to reorientation. Graduate Assistants, given the title of ETRs or Educational Technology Resources and assigned to specific teacher educators, assisted in the technology integration of their classes. The data collected included weekly reports from ETRs, semi-structured interviews with faculty at the end of years 2 and 3, and minutes from weekly project committee meetings. Of the five cases, the results varied. One case had technical issues, which were eventually resolved. In another instance, an instructor wanted to initiate concept maps in the classroom, which through the assistance of the ETR, proved successful. Two other cases also involved success in the classroom, as one case considered successful possessed initial issues with student participation. In the final year, the project worked toward transitioning from ETRs to learning communities, consisting of instructors, in an effort to continue the technology integration within the classes. The article outlines the benefits of contextual, collaborative training for teacher educators to promote higher levels of technology usage in the classroom, which results in effective modeling for preservice teachers.

The learning communities concept is also explored by Hadar and Brody (2018). As part of a larger research project, this portion of the study focuses on the various perspectives of

utilizing personal learning communities over a seven-year period. The PLCs met during the 10 months of the school year on a voluntary basis. Both researchers participated in the PLCs, one as an outside expert and the other as a faculty member and participant observer. Utilizing the grounded theory approach, data collection included semi-structured interviews, PLC session recordings, teacher educators' reflective writings, lesson plans and student artifacts, and PLC attendance. After data analysis, the researchers found multiple positive results, which include professional self-confidence, willingness to implement new skills, sense of belonging, and a commitment to improve teaching. Prior to the study, instructors existed in a silo-style environment with little integration to other areas. However, the PLCs helped to reduce the professional isolation and provide a new integrated style within the university. As discussions comprised multiple subject areas, teacher educators also had the opportunity to view the students' learning experience. The study provides another example of the advantages of learning communities among higher education faculty and the value of department integration.

Lesson study as a professional learning method is usually completed in a face-to-face format. However, the events of 2020 and the COVID-19 pandemic prevented such opportunities. An educator team at Bowling Green State University (BGSU) in Ohio utilized this unique situation to create a remote lesson study format (Weaver et al., 2021). Lesson study comprises a 4-step method of study, plan, teach, and reflect. It begins with a group of educators meeting to research and develop a lesson on a topic of interest. As a team member uses the lesson, the remaining members collect data. Following the lesson, reflection, evaluation and analysis of the data is completed.

The five-member BGSU research team proposed that utilizing the lesson study format in a virtual context may augment the various aspects of the lesson study method. Using a qualitative

case study, the research team researched and planned a lesson around the topic of leading a discussion. The lesson was facilitated in a Canvas class shell with Zoom, GoReact, and Padlet as just a few of the digital tools used by both the research team and students. Upon analysis of the data, four themes emerged: digital tools promote learning, digital tools promote discussion, digital tools limit instruction, and digital tools expedite debriefing (Weaver et al., 2021). The online format provides the opportunity for educators in any location to collaborate in a lesson study group. The research team concluded that a remote lesson study format reduces isolation and builds community for educators regardless of location.

In recent years micro-credentialing has provided new professional learning opportunities. Gamrat et al. (2014) developed the Teacher Learning Journeys (TLJ) - an online, personalized professional learning program utilizing digital badges, also known as micro-credentials. Though data were collected from 36 teachers completing 154 professional development activities, the final research utilized a case study which analyzed eight educators' work. The thematic analysis revealed three areas. First, researchers considered educator choice in content and level of assessment as the primary advantage. Second, the digital badge professional learning choice flexibility permitted educators to create personalized goals. Third, expert feedback assisted in the continued professional learning program. As educators completed tasks and received feedback, it assisted in additional customization of an individual's specific professional learning. The research team concluded that multiple elements were important in a digital badge professional learning program. Flexibility, including content, assessment, and goal setting, provided a personalized learning experience that often was influenced by an educator's current knowledge and expertise. The overall program was considered a positive experience by participants.

A mixed methods study explored how participants in a digital badging program utilized for higher education professional learning found that most participants also had a positive experience, with over half citing the digital badges as "authentic and innovative" (Dyjur & Lindstrom, 2017, p. 386). Quantitative data revealed participants were pleased to receive the digital badges (87.5%), which provided motivation to earn more badges either from their current institution (68.75%) or from another institution (50%). Other motivating factors included career advancement, job opportunities, or additional learning about teaching in higher education. Qualitative data revealed that participants felt that the badge design was elementary and unprofessional, which may have contributed to some participants' (25%) feeling that the digital badges were not authentic. Despite the negative feedback regarding the badge design, participants had already used their badges for digital and physical portfolios and resumes, provided to potential employers, shared to social media, and posted on personal websites.

Whether a learning community, lesson study, self-study, or other method, professional learning necessitates relevancy, which references andragogical core principle #1, the learner's need to know (Knowles et al., 2015). Providing personalized professional learning within their area of expertise assists to provide context, referencing contextual knowledge (XK) of the TPACK framework. In conclusion, those developing teacher educator professional learning need to keep the goal in mind, which is "not solely to develop the competencies of the teacher educator, but to support the faculty member in using and modeling those competencies in ways that positively impact the development of all teacher candidates" (Parrish & Sadera, 2019, p. 439).

The Role of Leadership

Leadership support is the key to program-wide and program-deep TPP technology integration. In his exploration of leadership for technology integration in a TPP, Clausen (2020) states, "In order to take hold, a technology infusion effort will require sustained support from [TPP administration] leadership that creates instructional contexts that empower faculty to spearhead and actively participate in the change process" (p. 185). This type of transformational leadership understands the change process by sharing a clear vision of the future that challenges the current system. Throughout the change process transformational leadership will also enable others to participate in the change process, which results in a feeling of encouragement throughout the organization.

Organizational change occurs as either revolutionary (transformational) or evolutionary (transactional) change (Burke, 2018). Evolutionary changes occur gradually and affect parts of the organization. Teacher educators engage in this type of change as they participate in professional learning to increase their technology competencies. The gradual change affects different individuals in different ways. Revolutionary change affects the entire organization, which correlates with the changes such as changing the TPP so that technology integration is program-wide and program-deep (Clausen, 2020). Unplanned revolutionary change can also occur, as evidenced by the COVID-19 pandemic.

Leadership experts agree that leadership begins by modeling or setting the example (Blanchard & Hodges, 2003; Kouzes & Posner, 2002; Maxwell, 1997). Successful modeling is evidenced by the correlation of the leader's values and actions. If a leader desires for the followers to adapt a certain behavior and ultimately the attitudes and values, those attitudes and values need to be seen in the leader's behavior.

A leader that sets the example motivates and inspires others with a clear vision of the future (Blanchard & Hodges, 2003; Kouzes & Posner, 2002; Maxwell, 1997). When a key objective is adult learning, motivation is vital. "Adults need to know why they need to learn something before undertaking to learn it" (Knowles et al., 2015, p. 47). Andragogical principles continue to weave throughout a leadership framework as communication presents itself at the center of motivation. Leadership not only communicates to others, but also listens attentively so that the leader can "appeal to a common purpose" (Kouzes & Posner 2002, p. 148). Communication among the leadership and followers brings to light individual and situational differences (see Figure 3 - outer ring of Knowles' Andragogy in practice model) that assists in providing understanding among both parties, which would prepare all parties for the vision of the future.

Leaders that move their organization forward will challenge the process or status quo (Kouzes & Posner, 2002). Education in the 21st century is experiencing dramatic changes. Transformational leaders will not wait for the change; they create it. Additionally, this leader will embrace a growth mindset, "disrupting the system as we know it by embracing a 'business as *unusual* model" (Sheninger, 2021, p. 10, emphasis added). This sets the transformational leader apart from all others. When leaders have set the example and motivate individuals, a passion for innovation and creation results throughout the organization. Think outside the box. Better yet – there is no box.

A wise leader recognizes that challenging the process, which results in change, creates a learning process for the stakeholders involved. In 1998, Malcolm Knowles developed the andragogy framework of adult development (Figure 3). Step one begins with the learner's need to know: why, what, how (what is the problem, why change is needed, and how it will be

accomplished) (Sheninger & Murray, 2017). At the very start of the change process (if not before), the leader should communicate with the stakeholders the answers to these three questions. If the leader becomes familiar with his team, he should know their prior experiences (number three in Knowles' model), which provides team members as possible resources and models during the change process. As each step builds on the next, the team now espouses a problem-centered, contextual orientation to learning (Knowles' number 5). Knowles' last step is motivation to learn, which includes an intrinsic value or some type of personal payoff (Knowles et al., 2015). Kouzes and Posner (2003) stress the importance of internal motivation in any effort. If the internal motivation does not exist, it will not be sustained. "True leaders tap into people's hearts and minds, not merely their hands and wallets" (p. 185).

Throughout the growth process, the transformational leader realizes that mistakes are not a failure but an opportunity to learn (Sheninger, 2021). The consistent effort continues to develop a high performing organization as leaders enable others to act. Multiple research studies have shown that enabling others to act creates a climate of trust, which in turns creates a happy, psychologically well-adjusted team (Kouzes & Posner, 2002). Organizational leadership that permits individuals the balance of individual autonomy while collaborating with colleagues will create an atmosphere of trust within the organization.

When a leader follows the first four practices (Model, Motivate, Challenge, Enable), it naturally leads to the final practice, which is encouraging others (Kouzes & Posner, 2002). Leadership's acknowledgement of stakeholder input creates a spirt of community that augments the leadership practices. There is no such thing as too much positive. Set an example by fostering positive expectations and finding people who are doing things right. Create a spirit of community by encouraging others to do the same.

The American Association of Colleges for Teacher Education (AACTE) saw the need for a tool to assist education leadership in implementing the TPACK framework. To fill the need the AACTE Innovation and Technology Committee developed the TPACK Leadership Diagnostic Tool so that leaders can "provide direction" and "exercise influence with a goal of organizational improvement" in TPACK (Graziano et al., 2017, p. 372). The foundation of the TPACK Leadership Diagnostic Tool incorporates the Theory of Action (Argyris & Schon,1974) and the Transformational Leadership Framework (Leithwood et al., 2008). Theory of Action is best explained as a cause-effect relationship or logic model. In the TPACK scenario leaders will evaluate how the change will happen, what is under their control, and what they wish was under their control (Graziano et al., 2017, p. 374). The Transformational Leadership Framework provides innovation. Leaders will establish a vision, which will then necessitate creating a plan to develop faculty and redesigning the organization to achieve the vision.

The TPACK Leadership Diagnostic Tool is designed to guide leaders through the implementation process. The tool, divided into Theory of Action and Key Leadership Functions, provides leaders options to evaluate progress at the beginning, developing, acceptable, and leading stages. The tool's design provides enough detail to be beneficial yet is general enough to apply to any teacher preparation program. Graziano et al. (2017) recommends further research regarding the tool's effectiveness and the possibility of tool modification for use in the K-12 setting.

A case study from three teacher education institutions within the United States provides insight into the effectiveness of the TPACK Leadership Diagnostic Tool (Clausen et al., 2019). Two rounds of semi-structured interviews were held at institutions with TPACK based initiatives. The study is based on the second round of interviews held one year after the first interview to

discover the progress of the TPACK initiatives and how the TPACK leadership diagnostic tool was used.

The first question the researchers sought to answer was how the tool was used during the TPACK implementation. The participants answer resulted in a similar theme: the tool was used more for reflection and less as reference. One participant commented, "[it] helped you to look as you [are] defining, refining, developing programs or initiatives …. I can't attend to everything at every moment, but it helps me to think about where is the appropriate pressure point right this minute" (Clausen et al., 2019, p. 60). Key leadership functions ($n = 39$) was the most frequently addressed category when asked how the TPACK leadership diagnostic tool provided ways to examine current practice. Though a variety of topics were discussed in the zone of wishful thinking ($n = 36$), favorable policy environment referencing accreditation was mentioned by all three institutions. Despite the attempts to create the TPACK Leadership Diagnostic Tool with a general format, participants recommended that more specific TPACK elements be added, possibly as "guiding questions" (Clausen et al., 2019, p. 64). Additionally, they also suggested providing examples of various tool elements and tool levels.

Clausen et al. (2019) concluded that additional "support, scaffolding, or even training" is necessary to effectively use the tool (p. 65). Additionally, utilizing the Measures/Artifacts Used column within the tool will provide leaders a means to evaluate their progress. When the goal is transformational and sustainable change for a teacher preparation program, using the tool as a resource rather than an occasional reference can lead to a rewarding outcome.

Summary

This chapter presented a review of the literature related to the exploration of the experiences of teacher educators who use technology for teaching and learning. The literature

reviewed revealed the need for educators to follow frameworks, taxonomies, and standards containing technological, pedagogical, and content knowledge utilized appropriately within various contexts (Foulger et al., 2020; Mishra & Koehler, 2006; Puentedura, 2020). An understanding of the principles of adult learning or andragogy (Knowles, et al., 2015), the adult generational mix (Holyoke & Larson, 2009), and an individual's acceptance of technology (utilizing the Technology Acceptance Model) (Marangunić & Granić, 2015), will provide TPP administration insight into the support needed for teacher educators. Relevant professional learning for today's teacher educators includes personal learning communities, lesson study, micro-credentialing, and numerous other innovative formats. A TPP with teacher educators who teach with technology as well as teach about technology integration will not succeed or be sustained in the long term without the TPP administration supporting and leading the transformational change (Blanchard & Hodges, 2003; Burke, 2018; Clausen, 2020; Kouzes & Posner, 2002; Maxwell, 1997).

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

Research suggests that how teacher educators use technology integration throughout the TPP highly influences the preservice teachers' future technology use (Voithofer et al., 2019). In addition, current research regarding how teacher educators integrate technology is lacking. The purpose of this qualitative, phenomenological study was to explore how and to what extent teacher educators evaluate, align, and demonstrate technology within teacher preparation programs. This chapter highlights the research methodology and procedures used in the study which includes design, procedures, and limitations.

Research Design

A qualitative, phenomenological study was used to explore how and to what extent teacher educators evaluate, align, and demonstrate technology within teacher preparation programs. Though many phenomenological philosophies exist, researchers' basic definition of phenomenology is "the study and theory of *lived experience (Erfahrung)* [sic]" (Brinkmann & Friesen, 2018). Husserl, considered the founder of phenomenology, emphasized the importance of context with experience, which is applicable to teacher educators who use technology for teaching and learning. Teacher educators use frameworks, such as TPACK, within the context of their own classrooms and teacher preparation programs (TPP). This results in multiple interactions, providing descriptive, expansive experiences, as described by educational phenomenologists Dreyfus and van Manen. Brinkman and Friesen (2018) summarized the use of the phenomenological research design in education by stating "learning *from* experience consequently becomes learning *as* experience" (p. 596, emphasis added). Applying phenomenological design provides the researcher a window into the teacher educator's content and contextual expertise while integrating technology within a TPP.

Utilizing not only TPACK but also the TETC #1 is not simply the application of knowledge and skills but the application of "lived experiences" (Brinkmann & Friesen, 2018, p. 605). To further discover teacher educators' *lived experiences* utilizing technology within TPPs, TETC #1 and its sub-criteria were utilized in developing the research questions. This study addressed the following research questions and sub-question:

Research Questions

1. What are the experiences of teacher educators utilizing technology within a teacher preparation program?
2. How do teacher educators evaluate content-specific technologies for teaching and learning?
3. What approaches do teacher educators use to align content, pedagogy and technology?
    a. How do teacher educators demonstrate this alignment to pre-service teachers and teacher candidates?

Population and Sample

Participants in the study consisted of 10 teacher educators, who teach in undergraduate TPPs. Using purposive sampling (Creswell & Creswell, 2018), participants were selected from the researcher's personal contacts, other experts' recommendations, and social media professional networks contacts, such as LinkedIn. As additional participants were needed, teacher educator emails were sought through the institution websites. Institutions were chosen based on rankings as top TPPs from such sites as U.S. News and World Report and study.com.

An email was sent to potential participants (see Appendix B) through Qualtrics XM, which included the participant interest form link (see Appendix C). The participant interest form provided demographics including location and content area. Emails were sent in batches

ranging from 50-94 potential participants. Two to three reminder emails were sent with a 7-10 day window between each email. The complete list of potential participants totaled 294 with 14 responses received. Of these 14, one did not qualify (the individual was not a teacher educator), one declined the interview and two did not respond to the request to schedule an interview.

The initial email process began in June 2021. The response rate was slow, which is likely due to the summer timeframe. Initially the goal was to choose based on content area and location in order to provide rich data for increased validation. However, as long as an individual was a teacher educator and the researcher had not already interviewed someone from the same institution, a request to schedule an interview was sent. Additionally, to provide "multiple perspectives that range over the entire spectrum of perspectives" (Creswell & Poth, 2018, p. 219), and to avoid ethical issues, participants were not sought from the researcher's university, Bowling Green State University. The participants were sent an email stating their selection for the study, which included the opportunity for the participant to select an interview date and time. The email stated that scheduling the interview was consent for the interview (see Appendix D). Though the content areas represented in the sample did not meet the initial goal, the participants provided a range of content areas, including math (2), language arts (2), technology (1), early childhood and special education (1), curriculum and instruction (3), and special education (1). This variety provided rich data for stronger validation. In addition, the participants were from 10 different institutions in nine different states. Of the ten participants, four participants have 15 or more years of experience as a teacher educator, two participants have 11-15 years of experience, and four participants have 6-10 years of experience. Interviews were semi-structured with mostly open-ended questions allowing the interviewees freedom to

present their experiences and applications of technology in teacher preparation programs (see Appendix E).

Data Collection and Analysis

Upon approval by the Institutional Review Board (IRB) in May, the sample group was contacted through direct email or social media (LinkedIn) messaging. Those interested clicked on the provided link to complete a participant interest form (Appendix C). This informed sampling was based on the respondents' role as a teacher educator, their location, and their institution. Interviews were scheduled with eligible respondents (n = 10).

Interviews provided rich data including varying contexts (Jacob & Fergerson, 2012). Interview participants agreed to one interview of approximately 60 minutes with the possibility of a second interview of the same duration, if needed for additional information. The goal was 10 individual initial interviews, which was achieved. The interviews were conducted from June 8 through August 4, 2021. The interview lengths varied from 38 minutes to 1 hour and 20 minutes, with an average of 46.67 minutes per interview. Due to the variety in interviewees' locations, interviews were conducted through Zoom, a video conferencing application. Interviews consisted primarily of open-ended questions. The researcher recorded the interviews which were transcribed automatically through Zoom. The researcher reviewed the transcript for accuracy, once without the interview recording and once with the recording. Following this process, the transcript was sent to the interviewee for approval. Six of the ten interviewees responded with either minor or no corrections to the transcripts. The interviews' objective was to meet the following criteria: (a) to detect teacher educators' evaluation process for content-specific technologies for teaching and learning, (b) to uncover the approaches teacher educators use to align content, pedagogy, and technology, and (c) to reveal how teacher educators demonstrate

this alignment to pre-service teachers and teacher candidates. The interviews were reviewed utilizing both the research and interview questions to determine if follow-up interviews were needed for clarification or additional information. The researcher determined that the participants' thorough answers from the initial interviews provided sufficient data; therefore, second interviews were not required.

During the analysis stage, the researcher used an inductive approach (Maxwell, 2013). The first phase of this approach was the creation of narrative summaries based on each participant's transcript. These narrative summaries provided the participant's perspectives of their experiences integrating technology in TPPs, including providing context to their experiences. Direct quotes including detailed examples from the interview transcripts were utilized in the narrative summaries. The researcher frequently referenced the interview transcripts and narrative summaries in order to elicit broad themes, also called categories. The varying participants' perspectives discovered through patterns in the findings were coded and presented within the various themes. To conclude the analysis process, the researcher wrote a descriptive and realistic summary report that includes "the voices of participants, the reflexivity of the researcher, a complex description and interpretation of the problem, and its contribution to the literature or a call for change" (Creswell & Poth, 2018, p. 81).

Credibility and validity are necessary components of any research study. Of the many factors that can affect credibility, two are researcher bias and reflexivity. Researcher bias is defined as "the selection of data that fit the researcher's existing theory, goals, or preconceptions, and the selection of data that 'stand out' to the researcher" (Maxwell, 2013, p. 124). To reduce researcher bias, the research written report includes a discussion of my past experiences, biases, and orientations that may affect the data interpretation. Reflexivity, also known as reactivity, is a

researcher's presence or influence on the setting or individuals studied. For a qualitative researcher, the question is not how to eliminate the reflexivity but how the researcher's presence influences the interviewee's responses and how this affects the validity of the responses. In the present study, the researcher's experience in educational technology provided the opportunity to extend questions to further explore the experience of teacher educators' experiences in TPPs.

Validation was established through member checking and an audit trail. Both areas also provided rigor. Many researchers consider member checking a natural component of qualitative study (Hays & Singh, 2012; Lincoln & Guba, 1985). By providing a portion of the participants with the analysis, interpretations, and conclusions of the research at various stages, they provided input on how the research "represents their experience" (Hays & Singh, 2012, p. 206). For purposes of this research, the member checking goal was to seek input from half of the interviewees. All 10 interviewees were sent their edited transcript. Six interviewees approved their transcripts, some with minor comments or changes. Four interviewees did not respond to the transcript approval. Each interviewee's transcript was developed into a narrative summary, including rich descriptions and quotations from the interview. The narrative summary was also sent to each interviewee. All 10 interviewees approved their narrative summaries.

An audit trail was created through memos, interview field notes, interview transcriptions, and any other artifacts collected during the research process. Field notes were created by the researcher during the data collection process from June through August 2021. When data collection activity occurred, whether researching potential participants, sending emails, conducting interviews, or other data collection activity, the researcher created a field note journal of the activities and any other observations, such as possible changes for future interviews, initial responses to emails, and so on. Memoing was used by the researcher to capture various ideas and

integrate them into the analytic process. Memo categories comprise segment memos (ideas from particular data phrases), document memos (ideas from individual or multiple files), and project memos (the consolidation of multiple ideas) (Creswell & Poth, 2018). All three types of memos were seen throughout the data analysis phase. As the transcripts were reviewed, if quotes or other salient data came to the researcher's attention, a note of it was made in a separate document. As the narrative summaries were written, thematic data was noted, either directly on the documents or separate documents. Certain interviewees offered artifacts as examples of technology integration within their courses. In a digital format, these artifacts ranged from links to online discussion forums, books, frameworks, and other resources.

Rich data assisted in increasing both credibility and validity. This was provided first through the verbatim interview transcripts, which were verified by six of the ten interviewees. Providing rich data also involved specific detail, not only explaining the how of their experiences but also the why of their experiences, resulting in a conjoining of abundant details. The researcher was compelled to follow an iterative process, continually returning and reexamining the raw data for additional descriptions, such as quotations or action verbs (Creswell & Poth, 2018). As previously mentioned, the varying interview contexts from ten different institutions in nine different states also contributed to rich data.

Benefits

Participants received no direct benefit for their participation in the study except for their reflection as a teacher educator on the use of technology within the classroom. As a qualitative study this research not only provides a rich and descriptive depiction of the teacher educator's teaching with and about technology within undergraduate teacher preparation programs but

provides indication of gaps, which could be filled through future professional learning and leadership.

Ethical Concerns

The study presents no additional risk to the participants beyond that to which they would normally be exposed. The study was approved by Bowling Green State University's Institutional Review Board. See Appendices B through E for recruitment communication and consent forms.

CHAPTER 4: FINDINGS

A qualitative, phenomenological study was used to explore how and to what extent teacher educators evaluate, align, and demonstrate technology within teacher preparation programs. Using the TPACK framework, TETC #1, and the educational phenomenological work of Dreyfus and van Manen (Brinkmann & Friesen, 2018), I interviewed 10 teacher educators in teacher preparation programs from 10 different universities or colleges in 9 different states, reaching from Virginia to South Dakota.

Participant Backgrounds

Upon completion of the participant interest form, individuals were assigned a recruitment number. Fourteen individuals submitted the form. Of those fourteen, one declined the request for an interview, two did not respond to the request for an interview and one did not qualify due to his administrative position. Table 3 provides the participant demographics summary. Though the majority of participants were female, the other characteristics of age, experience, and content area were fairly dispersed.

Table 3

Participant Demographics

Participant Characteristic	*n*	%
Gender		
Female	8	80
Male	2	20
Age		
60+ years	5	50
50-59 years	3	30
40-49 years	2	20
Teacher Ed. Experience		
15+ years	4	40
11-15 years	2	20
6-10 years	4	40
Content Area		
Curriculum & Instruction	3	30
Language Arts	2	20
Math	2	20
Early Childhood & Special Ed.	1	10
Special Education	1	10
Technology	1	10

The institution demographics displayed in Table 4 also show the diversity among the participants. Of the seven public and three private institutions, nine states from South Dakota to Virginia are represented. Their student populations range from 1,600 to over 23,000. Finally, six of the 10 institutions are CAEP accredited.

Table 4

Institution Demographics

State	Type	Population	CAEP Accredited
Kansas	Public	15,033	Yes
Michigan	Public	16,234	Yes
Iowa	Public	11,907	No
Kansas	Private	1,600	Yes
Wisconsin	Public	2,559	No
Pennsylvania	Private	9,500	Yes
Minnesota	Private	4,500	No
Virginia	Public	23,800	No
South Dakota	Public	3,268	Yes
Arkansas	Public	11,829	Yes

Note. Population based on institution website statistics.

Participant #1

A junior high school math teacher for 25 years in both Oklahoma and Kansas, Participant #1's initial interest in higher education occurred when she became involved with the Council for the Accreditation of Educator Preparation (CAEP) accreditation. To pursue higher education, she completed a Doctor of Philosophy in Curriculum and Instruction with an emphasis on mathematics. Now over 10 years later, Participant #1 is a Full Professor focusing in mathematics education at a state university in Kansas. As a national board-certified teacher, Participant #1 keeps current with the today's trends and issues with memberships in the National Council of Teachers of Mathematics (NCTM), NCSM-Leadership in Mathematics Education, and the National Education Association (NEA).

Participant #2

Participant #2 spent the first twenty years of his career as a K-12 teacher in special education in the English language in Canada, Japan, and the United States. As a technology user since the early 1980s, he wrote an educational technology book in 1999. Due to the success of his book, he received an offer as a clinical professor in higher education. Over twenty years later,

he is a full professor at a large Michigan university and has taught numerous educational technology courses at both the undergraduate and graduate levels. A Certified Educator by the International Society for Technology in Education (ISTE), a Quality Matters Reviewer and Google Certified in multiple areas, Participant #2 has written or collaborated on several books as well as participated as a board or committee member on various educational technology organizations. Participant #2 holds a Doctor of Education in Educational Leadership.

Participant #3

As an associate professor at a public university in Iowa for over 15 years, Participant #3 holds a Doctor of Philosophy in Early Childhood Special Education. Initially working at a special education preschool (birth to 5 years old) for 7-8 years, she then became the education coordinator for the preschool for an additional 2-3 years. During this time, a leadership grant enabled her to pursue her doctoral degree. She keeps informed of the latest issues in her content area as a member of the National Association for the Education of Young Children (NAEYC), the National Association of Early Childhood Educators (NAECTE), and the Council of Exceptional Children, Division of Early Childhood.

Participant #4

As a teacher educator for 23 years, Participant #4 is a Professor of English at a small, private university in Minnesota. While she was working as an 8th grade English teacher, a retiring professor encouraged Participant #4 to apply for the soon-to-be-open position. She applied and during the interview realized that it was an opportunity to "increase my reach … in terms of helping bring good teachers into the school system…." In addition to her Doctor of Philosophy in Curriculum and Instruction (with an emphasis on literacy education), she also maintains a Minnesota Teaching License for Secondary Language Arts (Grades 7-12) and plans

to receive the K-12 reading license in 2022. Participant #4 stays current with today's issues with memberships in the Minnesota Council of Teachers of English and the National Council of Teachers of English.

Participant #5

A small, private college in Kansas has been home for Participant #5 for 10 years. Her journey to teacher education has traveled several paths. As a public school principal completing a Doctor of Education in Educational Administration and Supervision, she wondered what direction to follow post-doctorate. Around this time a university in the area began a satellite program in educational administration. Participant #5 began teaching in this satellite program while still working as a principal. Over the years her work in higher education increased and she transitioned into curriculum and instruction. A full-time position at her current university opened and she retired from public education. Now an associate professor within the Teacher Education Department, she states, "I feel like those last 10 years have really been about preparing people to go out into the field." Participant #5 also participates in the Association for Supervision and Curriculum Development (ASCD) and the Association of Teacher Educators-Kansas (ATE).

Participant #6

Working in elementary education in Australia for 14 years, Participant #6 considers herself a "nerd" who likes to read textbooks and write blogs. During this same period, she had the opportunity to mentor other teachers, and says, "it kind of just organically happened…and doors open[ed]…." Her diverse educational background has contributed to her current position as an Assistant Professor of Education at a state university in Wisconsin. Though originally from Australia, Participant #6 loves the cold weather provided by her current location. Her background includes a Bachelor of Education in Early Childhood, a Master of Science in

Educational Technology, an Online Learning Certificate, and a Doctor of Philosophy in Education and Curriculum Studies. Participant #6 also holds memberships in the Early Childhood Teacher Association (ECTA) and National Association of Education for Young Children (NAEYC).

Participant #7

Participant #7 pursued her doctorate with the goal of becoming a teacher educator. In her own words, "I just knew. I love teaching and it's important to have good preparation of teachers and I knew I was up to that challenge. So, for me, I saw it as a leadership position in terms of preparing new teachers." A certified teacher and native of Puerto Rico, Participant #7 worked in both Puerto Rico and the eastern United States for almost 10 years before the transition to higher education. Now as an Associate Professor of Language Arts at a private university in Pennsylvania, she has been recognized as an Early Career Scholar by the School of Education. Also recognized as a leader, she was asked to be the Director of the Instructional Technology program and was instrumental in reinvigorating both the doctorate and master's programs. With a Doctor of Philosophy in Teaching, Curriculum and Change, she maintains memberships in three diverse organizations: The International Literacy Association (ILA), the International Society for Technology in Education (ISTE), and the American Educational Research Association (AERA). Her research areas are not only literacy but also diversity and equity, particularly in Latino education.

Participant #8

As a classroom teacher with children, Participant #8 was attracted to the flexibility offered through higher education teaching. With that in mind, she pursued a doctorate in special education. Though she thought she would someday return to the K-12 classroom, Participant #8

has taught in higher education for nearly 15 years in Hawaii and currently at a large Virginia university. Her professional interests vary with memberships with the Council of Exceptional Children: Teacher Education Division, the Division for Learning Disabilities, and Council for Children with Behavioral Disorder, and Council for Learning Disabilities.

Participant #9

Many teacher educators transfer to higher education directly from a K-12 environment. However, Participant #9 spent 6 years in secondary mathematics and 15 years as an instructional designer before returning to his alma mater, a state university in South Dakota known for its technology focus. As an Associate Professor in mathematics for eight years with a Doctor of Education in Instructional Design and Technology, Participant #9 continues to expand his horizons as a Google Certified Educator, Nearpod Certified Educator, and a Seesaw Ambassador. In addition, he maintains memberships with the National Council of Teachers of Mathematics, the South Dakota Council of Teachers of Mathematics, and the South Dakota Society for Technology Education.

Participant #10

After 30 years in the K-12 classroom, Participant #10 decided to complete a Doctor of Education in Curriculum and Instruction with an emphasis in reading and writing. Now with over 15 years of experience as a teacher educator, she is currently a professor in Curriculum and Instruction in Secondary Education and the non-traditional licensure program director at a public university in Arkansas. She states that, “It’s kind of a great way to end a career to go full circle and [help] train teachers.” Her professional memberships include the Association for Supervision and Curriculum Development (ASCD), the Association for Middle Level Education (AMLE), and the International Literacy Association (ILA).

The Journey of Forever Learners: Experiences of Teacher Educators

Every participant shared a different story of how they became a teacher educator. Each one, however, had one common element. Teacher educators enter higher education with some type of previous experience. These experiences range from K-12 settings, educational administration, or other related areas, such as instructional design. As dedicated professionals, they now devote their time to training the next generation of teachers. This creates a context in which teacher educators are forever learning, not only about their content-area, but also other areas such as technology, culturally responsive pedagogy, and diversity, just to name a few. The teacher educators' varied backgrounds provide an eclectic mix of experiences involving technology integration in TPPs. They utilize various frameworks, methods, and standards, not only for the evaluation of technology but also for the alignment of technology with content and pedagogy.

The COVID-19 pandemic challenged everyone at various levels, also providing the opportunity for many teacher educators to demonstrate their leadership abilities especially through mentoring and professional learning with fellow colleagues. Educational leadership is at a pivotal point in their organizations. Will they choose to continue technology integration's forward movement, or will they allow their organizations to slip back to pre-pandemic practices? Andragogical elements (e.g., readiness to learn, motivation to learn, and orientation to learning) are evident throughout TPPs from teacher educator pandemic experiences, as well as their professional learning, and educational leadership's support and planning of that professional learning. Both transactional and transformational change affected teacher educators, leadership, and students.

Codebook

The development of a codebook provides reliability (Creswell & Poth, 2018). The initial codebook was developed using the research questions as a guideline to develop the broad themes. Since the interview questions were also developed utilizing the research questions, the themes remained relatively unchanged during the analysis process. Keeping the themes close to the research questions also added credibility by reducing researcher bias. In the development of the themes, I purposely avoided, as much as possible, using my 30 years of technology experience and 20 years of educational experience. The thematic codes were developed directly from the teacher educators' interview transcripts and narrative summaries. During the coding and thematic analysis, the codebook was updated following an iterative process. Teacher educator experiences provided descriptions for the themes and codes. To minimize reflexivity, I focused on the research data to develop the descriptions for each theme and code. The codebook in Table 5 provides these themes, codes, and descriptions.

The first four themes focus on the topics related to the Teacher Educator Technology Competency #1 (TETC), from which the research questions were developed. The themes of The Evaluation of Technology and Aligning Content, Pedagogy, and Technology flow naturally from one theme to the next as many teacher educators align content, pedagogy and technology during the evaluation of technology. The shared data between these two themes provides evidence of this closeness. The Demonstrating the Alignment with Technology theme shows many facets of demonstration, including when technology works correctly and when it does not, which is modeled by teacher educators often based on their own comfort with technology. Technology should enhance student learning, which the data has shown provides currency, engagement, and versatility in ways not available without technology.

A study of teacher educators in 2021 cannot ignore the COVID-19 pandemic that descended globally early in 2020 and still lingers over 18 months later. Questions must be asked as to the adjustments made, the positive and negative effects of such adjustments, and moving beyond the pandemic. This naturally leads to the final two themes: Professional Learning and Leadership. Professional learning varied greatly among teacher educators. The support for technology integration throughout the teacher preparation program also varied among the institution leadership. However, teacher educators have seen the need for technology integration throughout their TPPs and institutions and taken on leadership positions to fill the gap.

Table 5

Codebook: Themes, Codes and Descriptions

Theme	Code	Description
The Evaluation of Technology	*Though the Teacher Educator Technology Competency #1 specifies the evaluation of "content-specific technologies for teaching and learning," the data revealed that a teacher educator evaluated educational technologies utilizing the same method, whether or not it was directly related to content.*	
	Frameworks and Standards	Utilization of frameworks or standards such as the Triple E, SAMR, UDL, etc., or ISTE or state education standards.
	Practicality	Teacher educators seek technology applications that meet the goals and objectives of the lesson or activity. It can also include ease of use of the particular technology tool or applications. Often used in conjunction with a framework or standard.
	Accessibility	This references the availability of technology through the university or what the university will permit. Possibly used with a framework or standard.
Aligning Content, Pedagogy, and Technology	*For many teacher educators, the alignment of content, pedagogy, and technology, which is essentially TPACK, relates to their technology evaluation process. Various combinations of frameworks, methods, and standards are used.*	
	Optimal Learning	Frameworks, such as the Universal Design for Learning (UDL), strive

Theme	Code	Description
		to provide the guidelines for optimal learning for all individuals.
	21st Century Assessments	Moving beyond the traditional assessment from the last century, assessments in the 21st century provide "robust feedback" and alternative means of assessment.
	The Balancing Act	The Balancing Act that is 21st century education encompasses "presenting standardized curriculum in a non-standardized way," as well as knowing when technology is best utilized in the classroom.
Demonstrating the Alignment with Technology	*Demonstrating alignment of content and pedagogy with technology is evident not only in the modeling and other activities that a teacher educator plans but also in the unplanned activities, such as technology issues.*	
	Modeling	Teacher educator actively uses and/or demonstrates technology to students and/or its potential classroom use. This can be technology based on the content area, for productivity, or other educational purposes.
	Teaching about Technology	This goes beyond modeling and reaches into the "nuts and bolts" of educational technology applications and tools.
	Handling Technology Issues	How teacher educators handle technology issues within the classroom.
Technology's Enhancement to Content Area	*Educators in the 21st century realize that in order to utilize technology in the classroom it must enhance student learning.*	
	Information Currency	Currency relates to the timeliness of the information; the timeframe is contextual based on the topic and content area.
	Engagement	Engagement refers to the technology's effectiveness in not only involving students in the learning process but also collaboration outside of the classroom.
	Versatility	The ability to utilize the same activity in multiple formats, such as with authentic assessments.
COVID-19	*The COVID-19 pandemic, which descended globally early in 2020, required some type of change in every educator at every level.*	
	Adjustments	The transitions caused by the pandemic.

Theme	Code	Description
	Moving Beyond the Pandemic	The effects of the pandemic that will remain, which can be both positive and negative.
Professional Learning	*Educators realize that they are also forever learners. This is evident through the professional learning and development that they pursue.*	
Leadership	*Leadership exists at multiple levels from university administration to the teacher educator. The successful institution is one that recognizes leaders at all levels.*	
	Institutional Support	Support for technology integration through the teacher preparation program from the leadership at the department, college, and university levels.
	Collaboration	Collaboration among the teacher educators, which may or may not cross departments.
	Suggestions for Improvement	Suggestions for improvement by the teacher educators regarding support from the department, school or university.

The Evaluation of Technology

As teacher educators evaluate technology for use within their content areas, the process varies from utilizing frameworks or standards to practicality and accessibility. In several cases, a combination of elements is utilized to select technology, often based on the context. The teacher educators who used frameworks or standards frequently had pre-existing higher levels of technological knowledge and skills.

Frameworks and Standards

Participant #7 uses the evaluation of technology as an opportunity for active learning with her students, displaying the closeness of the evaluation, alignment, and modeling of technology with content and pedagogy. When selecting educational technology, Participant #7 utilizes the Triple E framework (Enhance, Engage, Extend) by Liz Kolb, promoted in her book *Learning First, Technology Second* (2017). Participant #7 demonstrates this process with students through an evaluation rubric assignment. In addition, she asks questions on what the

objective is, what the goal is, and how it relates to the student's learning experience. She models this with students through detailed discussions of why a particular technology is being used. She continues by stating:

> ...when I first started as a teacher educator, I wasn't telling them why I was doing things and … they weren't making the connections like I thought they [would]. [There] were obvious connections, but I've found over the years, particularly with undergraduates and graduates, we have to tell them explicitly why you chose a software tool, [what] you're thinking, and ask for feedback.

Participant #2's view on selecting technology for the classroom is simple. It should be "free, functional, and ubiquitous," not a "high falutin' proprietary software that they'll never see in the classroom." In addition, the tech tool needs to be user-friendly so that an educator is comfortable utilizing it in the classroom. As part of this process, he focuses on the ISTE Educator Standards, referencing the ISTE Student Standards and the state standards where the institution resides. He provides the teacher candidates an initial list of 20+ tools (e.g., clickers, Canva, Quizlet, Seesaw), which enables the teacher candidates to create their own toolkit of things that they would like to learn about and potentially use in their classroom.

Also following the International Society for Technology in Education (ISTE) Educator Standards, Participant #10's institution provides students not only an educational technology course early in the program but also technology integration throughout their courses. The in-depth exposure to educational technology is important since the teacher preparation department works closely with local school districts regarding the technology used throughout the district. The department then attempts to integrate those technologies, such as Google Classroom, within

the program so that the teacher candidates enter their future classrooms prepared to use the technology available to them.

When selecting technology, Participant #9 utilizes the SAMR model (Substitution Augmentation Modification Redefinition) to focus on how the use of the technology can enhance learning. Desiring to model the process with students, he frequently talks through the various stages, including the technology's purpose and alternative methods for achieving the same objective. He also identifies features such as ease of use and information security.

Using the SAMR model along with the ISTE Educator standards helps Participant #9 in this process by allowing students to "make connections … with prior knowledge to new knowledge." This includes creating authentic assessments, especially formative, with tools such as Quizizz, NearPod, and polleverywhere. Taking it even further, he states, "technology allows us to … have students create assessments that can be shared beyond the walls of [the] classroom … whenever a student knows that their work is going to be shared with a wider audience, they up their game…."

Universal Design for Learning (UDL) is utilized by Participant #8 in evaluating technologies. By identifying the outcome and any potential barriers, she then researches the availability of any beneficial technologies. Some technologies Participant #8 considers a necessity, such as Bookshare, an online library of accessible eBooks, and various read aloud tools, which she embeds directly in her course shell. This process resulted in her use of Google Jamboards and other Google tools during the COVID-19 pandemic. She considers one of the biggest challenges online, asynchronous courses, in which "it's really difficult to establish true community through connections…." She has tested various new technologies "to make sure that they [the students] feel individually connected to me as a person." One such tool is the video

updates created by the Canvas learning management system (LMS), used by her institution. Though many colleagues utilized Flipgrid, she felt that the Canvas video tools helped to achieve her outcomes and to remove potential barriers. Participant #8 also prepares her students by utilizing technologies that they will see among the local school district, though she does not always feel these are the best choices, such as Schoology. She models technology evaluation primarily through a comparison process, describing a tool and the various choices surrounding it. Participant #8 is quick to add that "it really depends on what the need is," and admits that technology evaluation "should [be done] more purposefully."

Practicality

Many of the participants utilizing frameworks or standards in their technology evaluation also use an element of practicality. The following participants focus primarily on practicality or a combination of practicality and accessibility.

Participant #5 has deviated from traditional hard copy textbooks to online resources for multiple reasons. One is cost. Many students could not afford the cost of many textbooks available today. Another reason is currency. Textbooks take several years to reach publication, at which time content can potentially be outdated. By using research articles, websites, and online textbooks, Participant #5 provides a course with currency. She also considers the activity and how she wants the students to process the information, which has led to the creation of infographics and videos.

Participant #1's technology selection combines both practicality and accessibility, first initiated by university available technologies. For example, she utilizes Blackboard, the university's learning management system (LMS), along with VidGrid for video recordings, and GoReact for video evaluations. Focusing on math, she references the vetted resources available

on the Kansas State Department of Education Top Math Resource Websites page. Exploring technology is a collaborative effort as Participant #1 also maintains a presence on Twitter and Facebook. In addition, she enjoys exploring the resources students share through class assignments, which often are shared with the remainder of the class.

An iterative process is also utilized by Participant #1 in technology selection. First, she tries it herself. Next, she puts herself in a 4th grader's mind and how they would approach using the tool or resource. Finally, she asks her students to use it, provide feedback based on their standards, and finally reflect on whether they would use that tool or resource in the classroom. She also uses this process when students bring resources or tools to her, encouraging them to reference the research, stating "does it really get at the heart of what you want your students to learn, or is it just something fun or cute."

Participant #4 admits that "I'm not very systematic" when it comes to selecting technology for use in the classroom. For instance, in her Children's Literature course, she wanted to find a platform for students to share the books that they had read. She initially approached the IT department and the classroom technology assistant. Depending on their answer, she may also explore various tools online or consider a tool that she has seen through teacher observations.

The classroom strategy or activity is also a variable in the technology selection. Participant #4 asks the question "what technology can help us get the most out of [the experience]?" In group work during a video session, for example, if she wants to evidence their conversation, it will be recorded. However, if the conversation is ranking a selection of books from best to worst, the group will complete an online form. An individual, yet still collaborative, student example is completion of the literature that the student will use in their future classroom. Utilizing Google Docs, the student lists a variety of literature, following the instructor's

worksheet. After the instructor's review, the student uses the comment feature to explain why the various titles were chosen. Finally, the Google Docs are shared with classmates, who are instructed to ask 2-3 probing questions about the list.

In Participant #4's methods courses, she discusses the SAMR model (Substitution, Augmentation, Modification, Redefinition) with her students. She feels that many courses tell students what to do with technology but not the philosophy of technology. She discusses with students what "value add[ed] is there by using technology. If there's no value add[ed], … then it's just really a gimmick." She reviews with students her thinking process in the technology used with her course. Participant #4 also follows the same process when conducting teacher observations.

She includes the students in the evaluation of technology tools. In one instance, she used Backchannel Chat while students viewed a video. Students could provide comments and other feedback, producing a "running commentary" during the video. Afterwards both she and the students discussed Backchannel and the pros and cons of the tool. For some students, it was more of a distraction, and they missed video content. Participant #4 concludes this example by stating, "that's another way I evaluate [by] how easy is it … to use … or does it take on a life of its own and make us forget what it is we're supposed to be learning."

Participant #8 states, "If technology works the way that I expect it to work, I'm pretty good at using it…." Considering the technology's design and purpose, she is frequently an early adapter of technology. One such example is her early adoption of the Hypothesis annotation tool. This tool can be embedded into Canvas and allows annotations on documents, websites, and discussions. Her early adoption of this tool led to her presenting with the Hypothesis team and being a guest on the Hypothesis podcast.

Accessibility

Participant #3 bases much of her technology use on what the university will allow. Cost-free tech tools, such as the Google Suite, are usually open for use at the educator's discretion. However, for example, she wanted to use GoReact, a video evaluation tool, but the university endorsed Panopto. During the COVID-19 pandemic, she was able to lobby for the money saved from cancelled school observations to alternatively purchase GoReact for video teacher observations. She feels this is a powerful tool not only for the teacher educator's feedback but also for the teacher candidate's video self-reflection. She "feel[s] like COVID was kind of an accelerant to change, … it allowed us to expand our use of technology. And now I'm at a crossroads where I don't know what I'm going to do with the fall." Participant #3 is considering a hybrid of in-person observation and using the GoReact features. She still uses Panopto to create assignment instructional videos.

A similar process is followed by Participant #5 who looks at what is available, usually in reference to hardware or software, and two, what she has access to, generally referencing online content. Participant #5 noticed through field experience teacher observations that document cameras were used in the local schools. In order to train the teacher candidates in technology that they could potentially use in the future, Participant #5 lobbied the Education Department to purchase two document cameras, which were eventually purchased.

In addition to the ISTE Educator Standards and utilizing the technology of the local school districts, Participant #10 focuses on content, ease of accessibility, currency and authorship when selecting technology, such as websites. Two of the most frequently used websites through her courses are the Arkansas Department of Elementary and Secondary Education and the International Literacy Association. The university utilizes technologies such as the Blackboard

learning management system (LMS), Webex video conferencing, and the Kaltura video cloud platform. To maximize technology's effectiveness, instructors who teach the same course coordinate the course content and technology utilization. Participant #10 states, "…my theory, has always been to expose them to different ways or different programs … and then whichever one they encounter won't be totally new." She also believes that technology has enhanced her content area by offering a deeper perspective.

Teacher educators' evaluation of technology can encompass multiple frameworks, standards, or other methods. Whether teacher educators are aware of it or not, andragogical principles, such as an individual's readiness to learn, are utilized as teacher educators combine the evaluation and/or demonstration of technology with the aligning of content and pedagogy. Through this process, teacher educators are also demonstrating to pre-service teachers and teacher candidates some of the many benefits of technology, such as currency, relevancy, and content enhancement.

Aligning Content, Pedagogy, and Technology

The evaluation of technology relates with aligning content, pedagogy, and technology. For example, as presented previously, Participant #7 utilizes the Triple E framework (Kolb, 2017) to evaluate technology with her students, yet this also involves the alignment of content, pedagogy and technology. Participants #2 and #14 utilize the ISTE standards and state standards not only to evaluate the technology but also to align it with content pedagogy and technology. In addition to the frameworks and standards already mentioned throughout this analysis, two additional frameworks are mentioned here in regards to aligning content, pedagogy, and technology: the 4MAT framework (McCarthy & McCarthy, 2006) and the Smart Classroom Professional Development Framework (Department of Education, Training, and Employment,

2014). Many participants use various combinations of frameworks, methods and standards to align content, pedagogy, and technology. In addition, three sub-themes were revealed through the data: optimal learning, 21st century assessment, and the balancing act.

Optimal Learning

Participant #8's use of the Universal Design for Learning (UDL) provides an excellent example of not only evaluating the technology but also aligning the content, pedagogy, and technology. Utilizing the UDL guidelines, educators can identify any potential barriers preventing students from a purposeful and inspiring learning experience. As part of this process, identifying the most appropriate technology for the content and context aids in providing the optimal student learning experience. In a similar experience, Participant #4 stated earlier the importance of context asking, "What technology can help us get the most out of the experience?"

21st Century Assessments

Understanding the need for relevancy and context, Participant #2 uses 4MAT framework (McCarthy & McCarthy, 2006), which provides guidance in creating an anticipatory set for direct instruction. He emphasizes formative and summative assessments and the need for robust feedback but also the need for alternative assessment skills, such as webquests. Guided and independent practice also form a part of the assessment process. In the end teacher candidates should know how to share, present, curate, and assess information and knowledge so that they can "tie it all together in a great big bow in Google Classroom," commonly used in many schools today, especially since the COVID-19 pandemic.

The Balancing Act

Teacher educators expressed their concern regarding the need to move forward within the restrictions of the current system. "How do we deliver a standardized curriculum in a non-

standardized way?" evidences the enthusiasm that Participant #6 has for digital pedagogy but also the limitations of the current system. Utilizing standards and frameworks such as International Society for Technology in Education (ISTE) Standards, the Wisconsin State Education Standards, and the Smart Classroom Professional Development Framework, she recognizes that

> technology has evolved so quickly, and it will continue to do so, that our standards and our law … have not kept up…. Education in general hasn't kept up with research, in life, in the world…. We typically are still doing things the way we did a hundred years ago.

Participant #6 utilizes a variety of technology throughout her courses. The university utilizes the Canvas learning management system. She strives to utilize whatever applications already integrate with that LMS, such as Zoom. Additionally, she posts all course content in the Canvas class shell, whether the class is on campus or online. To provide a more participatory feeling to blended classes, Participant #6 livestreams the actual in-person class so that online students can join synchronously or watch the video at another time asynchronously. Common Sense Media provides numerous resources, along with other websites.

Understanding the balance between technology and other educational tools, she also passionately believes that if it can "be done with [a] red crayon, then [it] should be done with a red crayon, not with technology…." She urges educators and students to focus on the dynamic dichotomy that it is not just about substitution, but is about how technology extends, enhances, and transforms learning. Participant #6 continues by saying, "Unless it's bringing something to transform it, … I really look at what is the purpose of my using this tool. Is it the right tool for

the right task or am I just blinging it up? …that bling factor wears off really quickly with students."

She provides an example through a university technology purchase. Her university department purchased Apple iPads with an Apple Pencil for the instructors in bulk. The purchase was completed with little or no consultation with the instructors as to how it would be or if it would be used. Participant #6 did not see a need for its use in her classroom. Sometime later, an IT representative inquired how she was using it. She told him she was using it with a coloring app. He asked if she would like him to show her how other instructors were using it and she said she already knew. Instructors were grading online papers by hand-writing notes on the Apple iPad with the Apple Pencil. In Participant #6's mind, this is not enhancing or transforming learning and the instructors might as well do it "old school."

Demonstrating the Alignment with Technology

Modeling

Modeling has previously been shown with several participants, particularly in the area of the evaluation of technology, such as Participant #9's evaluation of technology utilizing SAMR. Another previous example is Participant #8, who exhibits modeling when she evaluates technology through a contextual comparison process with students. A similar process is modeled by Participant #1, using an iterative process to evaluate technology along with students.

One of Participant #5's goals with technology is to help students see "that technology isn't just for entertainment. Technology can help us know and learn and be and do and grow." She continues by discussing the visual, auditory, and kinesthetic features of technology: "You can listen to some things with technology, you can see something with technology, you can interact with it." She encourages teacher candidates not to "just throw up a video for students to

watch. You don't just send them off and say here's a topic, go do research.… [G]ive them some guidelines…set a purpose. Why are we watching this? What kinds of things are we looking for?" She models these strategies with her students through active conversations, frequently answering questions such as why a method or strategy was utilized.

Participant #7 uses individual online notebooks and shared online notebooks to model technology integration, as well as through the rubric assignment and how to troubleshoot technology issues mentioned at the beginning of this analysis. Utilizing Google, a student-teacher shared notebook is created along with a collaborative class notebook. These dual notebooks provide individualized learning between teacher and student in addition to collaborative learning among the students.

Participant #6 consistently models technology integration throughout her courses, including evaluation and pedagogical alignment. In student discussions she states, "You're going to teach me things, I'm going to teach you things." When students complete work such as infographics, eBooks, and wikis, Participant #6 encourages students to embed their submission within the Canvas LMS class shell as much as possible. The modeling she provides also extends into student professional learning through outlets such as Twitter and Facebook. She also encourages students to observe the technology that their students are using and think about how that technology can be utilized to engage them. Encouraging leadership among her students, she explains that the model used in their school should be collectively agreed upon. Recently, more than one former student has communicated with her that they have started a digital pedagogy committee within their school to address such issues.

Modeling effective technology integration is evident throughout Participant #6's work. When the COVID-19 pandemic arrived, modeling proved extremely beneficial. Because she had

already utilized technology to its fullest in both her on campus and online courses, transferring an on-campus course to an online format was in reality only a matter of where the student and teacher were located. In fact, in her efforts to reassure a student who was concerned about transitioning from on campus to online, she states,

> You're still going to continue everything you did previously. It's all there, it's always been there online. The only difference is instead of …coming on the campus . . . log onto Zoom. . . if it makes you feel any better, I'll connect the swivel and walk around my room [so it will be just like the classroom].

Participant #1 believes modeling the technology evaluation is important with students. Periodically in class she will present a resource. As a group they discuss the resource and walk through the evaluation process where, according to Participant #1, "they're hearing my thoughts in real time."

Teaching about Technology

Teaching about technology brings another dimension to demonstrating the alignment of content, pedagogy, and technology. Beyond modeling in which a teacher educator is demonstrating the use of technology, teaching about technology involves the "nuts and bolts" of technology tools and applications and often includes the student. Several participants provide examples of this process, including Participants #2 and #14. As an educational technology specialist, Participant #2 places the focus on the type of tool rather than a specific tool brand, a strategy also used by Participant #10. For instance, teacher candidates learn about spreadsheets through Microsoft Office Excel and Google Sheets to prepare them to work in any spreadsheet software. Other examples would be presentation applications (PowerPoint, Canva), word processing applications, video creation applications (Loom, screencastify), etc. In addition, he

separates technology into grade-level categories, such as early elementary, upper elementary, etc., or content area. Developing a toolkit also enables the teacher candidates to learn about curating materials. These and the following numerous examples show the teacher educators' use of the andragogical principle of orientation to learning. They are providing students problem-centered and contextual applications to scenarios they may see in their future classrooms. In addition, though no teacher educators used the term TPACK, what they are accomplishing through these examples are various stages of that model (i.e., technological pedagogical knowledge, technological content knowledge, and technological pedagogical content knowledge).

As a 40-year veteran of early childhood education, Participant #3 has seen many changes in education, including technology. She acknowledges that it is ubiquitous but that "we need to use it in ways that are responsible," and "that it doesn't replace the value of direct hands on. . . I use my common sense, my knowledge about child development, [knowledge] about how young children learn." She actively utilizes the guidance of organizations such as the National Association for the Education of Young Children, the American Academy of Pediatrics, etc. Participant #3 balances her student's activities between hands-on and those based in technology, based on which one will enhance the activity. "I don't want to ever replace the importance of hands on and …to just learn solely through technology…I feel like technology is a tool, …but it's not the end all and be all."

With a keen interest in diversity and equity, Participant #6 recognizes the reality in teacher preparation programs in which some are providing innovative technology integration contrasted with programs that possess little or no technology. The equity issue evidences in her Introduction to Education undergraduate class in which Participant #6 states that "I actually had

a number of students that have never owned a computer before coming to class, which blows my mind, …. For [one]…she said, 'I don't even have a microwave or a TV in my house and I had to buy a computer for this class.'" Participant #6 continues by describing the process needed prior to many classes and Zoom sessions to help this student arrive at a very basic technological skill level in order to complete the course.

Participant #8 saw the need for her student to access the state's online Individualized Education Program (IEP) system. Without access, instructors are resigned to teaching students through templates or a paper format. When teachers arrive in their new school, adjustment to the online system is not easy. For Participant #8 it just made sense to open the IEP system to teacher candidates for training. She approached the state of Virginia about opening the online IEP system. The state of Virginia agreed, and it is now open to all universities that would like to use it for teacher candidate training.

In addition to modeling the evaluation of technology with his students through the use of SAMR (Substitution Augmentation Modification Redefinition), Participant #9 utilizes a wide-ranging technology toolkit throughout his courses. These range from the Seesaw learning management system to multimedia tools such as Adobe Spark, WeVideo, and Canva. He also uses NearPod, which creates interactive presentations, for formative assessments. Focusing on math, Desmos tops the list, but he also utilizes iPad apps such as Math Doodles, the Math Learning Center, Dragon Box, and Sumaze.

Education students at Participant #9's institution receive a technology course during their program, but technology is also integrated throughout their other courses, depending on "the instructor and their comfort and confidence level with technology." Participant #9 believes this is important because "there's a little bit of a disconnect [when] they don't always see how the

technology applies to a subject that they might be teaching." Participant #9 models the evaluation and integration of technology with his classes by critiquing the online math programs. Using questions such as whether it teaches conceptual understanding or just surface knowledge, and other pro and cons, he urges his students to evaluate with a critical eye.

Participant #4 has already provided examples of how she teaches about technology through BackChannel and analyzing with SAMR. Her institution utilizes Moodle as its learning management system (LMS). Primarily for group work she extensively uses the Google Suite, including Google Docs, Google Forms, and Google Slides. Since NearPod is popular with local teachers, Participant #4 has familiarized herself with the NearPod basics. Another tool she employs is pollseverywhere to increase engagement in class discussions. She also creates videos with screencastomatic and organizes herself with Evernote. When the COVID-19 pandemic forced an online environment, VideoAnt, a video annotation tool, was employed for teacher observations.

Handling Technology Issues

Handling technology issues (e.g., non-functioning technology) in the classroom provide the perfect opportunity to demonstrate various skills. How teacher educators handle technology issues in the classroom can be affected by their own comfort with technology. Generally, teacher educators utilize their own critical thinking skills, which may or may not resolve the issue. If they have not done so already, they may consult with students, who often assist in resolving tech issues. The consensus among several participants is to always have a backup plan.

Participant #2 states, "… they should always be prepared for a plan B, so that would be a bigger issue for me in a K-12 class. … there are always [tech issues] in technology, you're always thinking in terms of workarounds." Even through COVID-19, if Zoom or some other

technology did not work, it did not present an issue because Participant #2 provided all the course content within the learning management system's course shell, which the student could then access independently.

Participant #5 considers herself "the world's slowest texter" but "feel[s] pretty competent both professionally and personally" when considering her technology skills. She strives to use a variety of technology "efficiently and effectively." She demonstrates this in her classes when tech issues arise. "I teach my students: you have to have a plan B, plan C, and …a D, E and F…. I have learned to try to approach it [tech issues], handle it, attack it, with some calm and patience, …." Participant #5 provided an example of moving from a non-functioning projector to a document camera. She continued by stating she publishes the week's agenda in Blackboard, the university's learning management system. If all else fails, students can reference on their own time the content in the weekly agenda.

Participant #6 considers herself a confident technology user. "I wouldn't say I'm expert because I don't think anyone can be [an] expert at all technologies…." Her confidence evidences when tech issues arise. For example, in a hybrid situation with students in the classroom and participating through Zoom, a video was visible for students on Zoom but not in the classroom. She told students to take a quick break and tried to resolve the situation herself. It worked for a few minutes only to fail again. At this point, Participant #6 told the students she will email them the link that they can watch independently and then moved on to another activity. Her point in this example is the need of a plan A, B, C, (and she continued through the letter L).

Remembering the early days of technology in the classroom, Participant #1 recalls building her own computer, stating, "I'm not afraid to try something…." She also believes patience is a key element when dealing with technology. When possible, she includes students

into the troubleshooting process. But in the end, "…you might not always have technology, or it might not work … today, and so always have … a backup." Participant #1 provides an example of online manipulative blocks that for an unknown reason do not work, so hands-on manipulatives are used.

Considering her technology skills, Participant #4 rates herself as a 7 out of 10. Eager to experiment with new tools and resources, she states, "I love using the tools that other people have made. I love playing with them, … thinking about their application, more kind of as a puzzle, and a way to engage people." When technology issues arise, Participant #4 believes her experience helps her solve many issues on her own. However, when issues present themselves in class, it often becomes a learning opportunity for the students as teacher and students work through the issue together. She provided an example from an online class during the COVID-19 pandemic. During a Zoom session, a video would not play with the sound. As she talked through the various troubleshooting steps, a student stated that another instructor had the same issue and simply unplugged the monitor, which resolved the problem. As with all institutions, tech support is available if it cannot be resolved by the instructor or students. At this point, it is time for "plan B," which may be students using their own devices or "doing [it] the old-fashioned way."

With a bachelor's in math and a minor in computer science, Participant #9's technology skills are understandably high, including "getting under the hood" with programming skills, web and database development, and designing three applications (apps) for the Apple store. This high level of skill translates to the classroom when technology issues arise. A problem-solver, Participant #9 stays calm and intentionally doesn't become rattled "because I want to model for my students that things don't always go the way you expect, especially when it comes to technology, so…. [I] spend a little time troubleshooting the issue and try to resolve it, but then

move to plan B, if things don't work." The most common examples he provides are issues with videos not playing properly, due to bandwidth or other technology issues. He plans ahead by downloading videos when possible so that he can "take out as many of the unknowns as I can prior to teaching."

Describing herself as someone who is motivated and loves to learn, Participant #7 describes her technology skills as, "a curious proficient person, rather than a knowledgeable expert." This "curious proficiency" is displayed when technology issues arise in the classroom. Using humor to diffuse the situation, she troubleshoots along with the students. If a solution is not found, tech support personnel are contacted. When a tech issue does not require immediate resolution, she may ask her class to allow her a week to find a solution. One example would be the emoticons in Zoom. She observed that the "thumbs up" emoticon was always yellow. Participant #7 considered this a diversity and equity issue and thought that the emoticons color should have the capability to change to colors such as black and brown. In discussing this issue with a doctorate student who specializes in educational technology, she discovered that this was already available. A simple color change to some but a major difference to others.

Participant #10 considers her technology skills proficient for both her teaching and personal needs. When technology issues arise in the classroom, troubleshooting is a group effort as the students always offer suggestions. If the collaborative effort is unsuccessful, Participant #10 indicates that her institution has a very helpful tech support department, who troubleshoots remotely or provides assistance in person. Participant #8's technology proficiency also translates to problem solving when technology issues arise during class, generally only calling technology support as "the last-ditch effort."

Technology's Enhancement to Content Area

Teacher educators recounted how technology enhanced their content area through information currency, engagement, and versatility. These three areas demonstrate the TPACK elements of technological content knowledge and technological pedagogical knowledge. Throughout this study, the TPACK concepts have been revealed, though not explicitly stated by the teacher educators.

Information Currency

The access to information has enhanced learning in early childhood education. Participant #3 discusses the ease of access to topics such as autism, different grade levels, different methods, and different content areas, all of which is "at their fingertips" and hopefully in a way to engage children. As an early childhood educator, she actively utilizes the resources available on the Fred Rogers Center website, stating, "…we really want children to have as much hand-on experiences with materials. We know that's the way they grow, … and we want to limit screen time for the developing brain …, but we also know that technology is part of their worlds…."

Currency in addition to extensive options are two major ways that Participant #5 believes technology has enhanced curriculum and instruction. She states, "I can point them in the direction of other resources that don't cost anything but still get our message across…and they may also be much more current." She provides an example of articles and websites for a Children's Literature course and an Other Literacy course, noting that the content was current within the last three years. She also commented on the options technology provided through the COVID-19 pandemic. Utilizing tools such as online polls, whiteboards, post-it notes, and breakout rooms, Participant #5 maintained an interactive classroom environment.

Engagement

Participant #9 summarizes technology's effect on his content area with this quote, "I feel like it has expanded the walls of my classroom. I've been able to use technology to connect with people that I would not be able to connect with." He provides both synchronous and asynchronous examples. His K-8 Math Methods class connected synchronously with a math teacher from Bangkok with discussions focusing around first year teaching. In addition, many of his math students serve as math mentors to K-8 students in the region utilizing the video tool Flipgrid. Since the college students and K-8 students schedules differ, the asynchronous feature through Flipgrid is the perfect tool for mentoring. Participant #9 expands on his earlier comment by stating, "[it's] creating expanding opportunities for students."

Engagement is one of the foremost technology benefits to curriculum and instruction, according to Participant #6. Livestreaming the blended course provides one example. She states, "It helped them think about how content can be presented in different modes for different levels of engagement for their students as well because they've reflected on their own engagement…." She has extended this engagement through Canvas chats and encouraging students to set up their own Zoom meetings for collaboration. Participant #6 concludes by saying, "[these different applications] give them space to engage in an authentic manner, in a timely space, which isn't always timely to our schedules of when the classes [are] being offered, which I think is much more important, because then that's much more authentic and meaningful." This also provides a rich example of aligning content, pedagogy, and technology.

Technology enhances Participant #4's content through collaboration and engagement, which is evident through the many examples already provided. Students also utilize an online notebook during class for immediate feedback and reflection. Participant #4 states, "we can

engage with the material in real time in ways that we might not be able to without technology so [it] brings us all together sooner, to look at things together is really, really helpful."

Versatility

For Participant #7 technology has provided versatility throughout language arts, as well as her courses. For example, when she transitioned her on campus courses to an online format during the COVID-19 pandemic, she was researching resources. During this process, she discovered a literacy webinar series from the University of Florida Literacy Initiative (UFLI). The material is the same content she would have included if she had created the videos herself. Participant #7 believes that "being a good teacher educator [is] also knowing where to find resources...not just doing the usual but is there something new, better out there. … Teacher educators can get comfortable and are still using a 2010 book for [a]technology class. What is that about? Get a new edition of the book!"

Participant #7 continues explaining the versatility that technology affords her content area by discussing her use of Flipgrid, Flocabulary, and Newsela. In her recent class, Diversity and Equity in Literacy Education, the student would select a reflection from the end of the chapter and create a Flipgrid video with their answer. More than an assignment, this provided a tool that students could immediately use in their own classroom that was based in theory and practice, thereby aligning content, pedagogy, and technology. Another Flipgrid assignment is a book chat. Participant #7 explains how Flipgrid provides personalized, individualized instruction through the individual feedback that she is providing. Similar experiences are found through Flocabulary and Newsela.

This versatility was put to the test when the COVID-19 shut down most universities in the spring of that year. Though her graduate courses were already online, Participant #7's

undergraduate classes were all on campus. According to Participant #7, many undergraduates, not used to an online format, "[feel that] if you are not meeting synchronously with them, that means you're not teaching." This issue, along with the fact that she was teaching from Puerto Rico while on Family Medical Leave, meant "it was just a matter of reinventing and finding ways to cover the same content, but in different ways."

Technology has enhanced learning for those students who learn better in a virtual environment. Participant #1 references the research regarding the need for hands-on learning to accompany virtual learning environments. However, in certain situations, such as the COVID-19 pandemic, hands-on learning for every student is not always possible, yet virtual environments can fill the gap. For this reason, Participant #1 believes that teachers need to prepare to work in both worlds.

Another example of how technology as enhanced learning is the expansive online program that exists at Participant #1's current institution, including the opportunity to complete an elementary education degree totally online. Students may then complete the student teaching requirement literally around the world. Participant #1 states that though many students complete their student teaching locally in Kansas, many others complete it in their home state, or have requested opportunities abroad, such as Germany. Without technology, these opportunities would not be available.

Participant #9 also feels that technology has enabled him to create more authentic assessments. For example, students create a video presentation called "My Math Classroom" in which they present at the school open house at the beginning of the new school year. In doing so they integrate the various topics from the course throughout their presentation, aligning content,

pedagogy, and technology. A productivity tool used by Participant #9 for student feedback is Floop, which he explains below:

> I could do everything Floop does without technology but Floop allows me to collect journals from all the students digitally [and] give feedback really quickly. So, it may not be changing what the students are doing, but it changes how quickly I can do it and that … frees me up to do more …to help the students, …spend more time planning, and provide more substantive feedback….

Technology has also provided versatility with data. With a focus on special education, Participant #8 believes technology has enhanced her content area through tools to track data, assist in database decision making, understand the data and ultimately communicate the meaning of the data effectively. For example, the National Center on Intensive Intervention offers an Excel template for progress monitoring. Since the instructors in her department use this template, it also provides consistency across the program. An enhancement to the classroom would be the stick pick app. This app completes the same task as writing names on a popsicle stick but collects data when used, which is needed in many classrooms. Participant #8 reiterates the need for data management, "[teachers and students] need to be able to convey this information and easily track it, [so] make sure you design a system that's easy for you to keep up with …."

COVID-19

Each institution handled the COVID-19 pandemic in the context of its own community, which aligns with the societal (the community), institution (university/college), and individual (teachers/students) growth of the andragogical goals and purposes for learning (the outer ring) (Knowles et al., 2015). The teacher educators dealt with a different set of challenges, including the individual, situational, and subject matter differences, Knowles' inner ring. Additionally, as

the teacher educator achieved not only enhancement of technology but also transformation of technology throughout their courses, even possibly the level of TPACK, the fewer adjustments were needed when the pandemic arrived. A variable even for these teacher educators was whether the courses were held synchronously or asynchronously. The teacher educator's technology foundation also provided the launching pad to increase already established skills even further. The challenge was to maintain an atmosphere to sustain the motivation to learning for students who were accustomed to face-to-face classes.

Adjustments

Though many institutions were solely online during the 2020-2021 school year due to the COVID-19 pandemic, faculty at Participant #3's institution were given the option of teaching in-person, online, or blended. Participant #3 began the year in-person with everyone wearing masks. However, the added requirement of restricted movement created difficulties in her early childhood classes. She explains, "I'm an early childhood person. …we move around, we do activities. I couldn't move them around. They couldn't interact freely, so I found Zoom allowed me to group them in different ways…." Over the 2020-2021 school year Participant #3 taught in all three formats: in-person, online, and blended.

With a well-developed online program prior to the COVID-19 pandemic, Participant #5 had few adjustments to the in-person classes that were transferred online when the pandemic affected education globally. Her course content was already in the Blackboard learning management system. Familiar with the Zoom video conferencing tool, she began using additional Zoom tools, such as polls, breakout rooms, etc., to continue to provide an interactive classroom environment. Creativity was utilized for in-classroom activities, such as working with

poster board, but overall, it was a smooth transition. For Participant #5 the most difficult part was getting "used to looking at my …face on Zoom all the time…."

Participant #1 also notes her institution had a "leg up" because of its well-developed online programs. However, she is quick to note that:

> on-campus students are on campus for a reason and virtual students take virtual classes for a reason…. So, the biggest issue was convincing. [We had to convince] those on campus that they could still get the exact same content in a virtual environment.

The spring of 2020 was easier in this process because the teacher and students had already been together for the first half of the semester. However, in the fall, when everyone was new to each other, it was sometimes difficult. At this same time, Participant #1 came to realize that every assignment was not necessary and did not have the purpose initially intended. In one course, she reduced the required lesson plans submitted to 5, instead of 10, stating, "five is sufficient with quality feedback."

When the COVID-19 pandemic shut down campuses in the spring of 2020, Participant #8's institution finished the school year with an asynchronous online format. She explained, "…we [didn't] know where the students [were], we [didn't] know what time zones [they were] in, we [didn't] know what technology they [had] so really [we tried] to just finish out the semester." However, when class resumed in the fall, the format was synchronous. Participant #8 states, "Online asynchronous I knew. Online synchronous was a big learning curve." Her focus during this time was the Google Suite and Zoom. Google Jamboard, a collaborative whiteboard, and Google Docs, "were really helpful for synchronous online teaching, so I could see what the group was doing … without popping into every [breakout] room." In use prior to the pandemic

by Participant #8, Hyperdocs utilized with the Google Suite products also proved to facilitate online assignments. The Google advantage is student accessibility. Students lose access to the Canvas course at the end of the semester. By placing articles and other reference material in a shared Google Drive folder, students have access to it beyond the course end, which has received good student response.

During her time as a teacher educator, Participant #10 has taught both online and an in-person, so in her words "the change [during the COVID-19 pandemic] was not as difficult for me…." However, some of her colleagues were in an opposite situation, "[they] only teach face to face, and they were just at a total loss as to how to do it." Though the university creates a class shell for each instructor's course in the Blackboard LMS, not all instructors utilize it. The biggest change for Participant #10 was using Webex to teach and not just for meetings. She sought to keep the engagement throughout her classes. One strategy used was break out rooms. For instance, students would view a video, discuss it in small groups, then return to the large group for the final discussion.

In the spring of 2020 Participant #9's institution did shut down for the remainder of the school year due to the COVID-19 pandemic. However, in the fall of 2020, they resumed in person classes. Classes differed in that they were blended, with some students in the classroom and some on Zoom, for those who were sick or in quarantine. An avid technology user prior to the pandemic, Participant #9 did not add any new technology to his toolkit. However, he did use NearPod, Zoom, and Loom more than prior to the pandemic.

Participant #6 immersive technology integration prior to the pandemic created a context in which she was required to make few adjustments, as evidenced by the scenario provided in the modeling theme.

Moving Beyond the Pandemic

As the world recovers from the pandemic, one often hears phrases such as "the new normal" or "let's get back to normal." Though it is generally agreed that K-12 students need personal face-to-face interaction, many also hope that the technological knowledge gained by teachers at all levels remains and continues to move forward. The transformational change that occurred within education provided teacher educators an opportunity to see the application of technological pedagogical knowledge, technological content knowledge, with some even arriving at technological pedagogical content knowledge or TPACK.

Participant #3 provided an example of this earlier in the data analysis regarding the use of GoReact for in-person observations. She noted that this was so successful that she is considering a hybrid option (in-person and GoReact) for Fall 2021. Another example is Participant #7's discovery and use of the University of Florida's Literacy Initiative webinar series, which she intends to continue to utilize within her courses.

Participant #4 believes that her familiarity with online tools, such as Google, prepared her for the COVID-19 pandemic. The focus was on leveraging what she already used and simply increasing the depth of the tool use. She describes creating Google Slides "a little richer visually." In addition to using more features in the Zoom video conference tool, she "worked a lot harder at stopping and asking for feedback or asking…if there were questions …more frequently." Through online teaching, Participant #4 discovered a new strategy for a traditional assignment. Students conduct book groups, similar to literature circles in fourth grade, in which

they discuss a book and then write a report. With the advent of the pandemic, the book groups transferred to Zoom video meetings. Participant #4 asked each group to record the meeting. Since she can now listen to each group's discussion, as little or as much as needed, she decided a written report was no longer necessary. This provides the student the opportunity to focus their energy on the book group instead of the report. The results were astonishing:

> … I think I'm going to do [this] forever … because it gave me such a rich picture of their discussion and … it made the discussion feel more important because it wasn't about getting a grade on the written report afterwards it was about getting a grade on the way they jumped in and participated. So that's a way that technology … directed my pedagogy.

Participant #2 explains that prior to COVID-19 only one-third of the education majors received a technology integration course, which is offered during the third year. Though the institution would like to integrate technology throughout the coursework, most of the teacher educators are older and either do not utilize technology tools or are implementing them very slowly. This slow adaption of technology was evident when the COVID-19 pandemic descended in 2020. Teacher educators approached Participant #2 about recording lectures for online classes, not realizing the technology tools that were available to create an interactive learning experience. After working through multiple strategies with teacher educators throughout his department, he states, "I think my faculty are actually at a point now where they're using the technology more wisely than they did a year ago." He concluded by saying, "…my whole goal is that students will never have to watch a one-hour talking head ever again…."

Professional Learning

Though the majority of the participants complete professional learning opportunities within their institution, most professional learning is completed outside of the institution through webinars, certifications, and conferences. Several participants are also currently writing or planning to write a book. At least two are also involved in some type of mentoring program. The findings suggest that teacher educators are self-directed and self-motivated learners. They simply love learning. Not to rest on their present knowledge and accomplishments, these teacher educators seek out the current knowledge and research in technology, pedagogy, and content.

Participant #2 personally engages in extensive professional learning in addition to his many certifications. He would like to become a Google Certified Innovator and explore digital badges. In his spare time, he may begin to write another book. This just begins to portray the professional learning carried out by Participant #2. His goal is encapsulated in this quote, "I wake up every morning happy because hey there's so much more to learn and learning it. Here's why I do this stuff. If you don't keep learning, you'll never understand what it is your colleagues are going through, and what your teachers are going through, and what you know. You forget quickly what it's like to learn and to keep learning new things."

Always eager to learn, Participant #7 looks forward to professional learning in the coming year. First on her list is the Mursion Simulation program, which was recently acquired by her university. She is also attending a virtual convention for the Carnegie Project on the Education Doctorate (CPED). Time permitting, she is also interested in investigating virtual robotics and attending International Society for Technology in Education (ISTE) courses.

Participant #6 actively participates in Twitter and other online professional learning communities, Campus Enhancement Day (at her institution), open education resource training,

equity, diversity and inclusion training, and in the past year completed an Online Learning Certificate. A new topic this past year for her was mental health first aid training, which she is considering how to provide to online students. Not resting on past accomplishments, Participant #6 plans on continuing her equity, diversity and inclusion training in the coming year. In addition, she has recently registered for a 12-month mentor program to develop community connections.

The Teaching Innovation and Learning Technologies (TILT) at Participant #1's institution has provided on-demand professional learning throughout the COVID-19 pandemic, which she has utilized. In addition, she attended the National Council of Teachers of Mathematics (NCTM) virtual conference. However, she expresses a preference to in-person conferences rather than virtual conferences, saying, "…I realized how much we miss networking [by] standing in line…going to dinner…talking to someone in a session… I think we're all kind of craving that personal connection." She looks forward to the professional development day that TILT provides before the beginning of each semester. Participant #1 also presented at the National Rural Education Association Convention in Indianapolis in November 2021. An annual event for her, Participant #1 will also attend the Hawaii International Conference on Education in January 2022.

In addition to using Twitter as part of her professional learning network, Participant #4's professional learning focused on several technology topics over the past year including the Hypothesis annotation tool, online learning presentations, creating community with Zoom webinar, and The Distance Learning Playbook webinar series. Turning her direction to her content area, she virtually attended the Adolescent Literature Conference of the National Council of Teachers of English.

Participant #8's recent professional learning has focused around reading and writing. In addition, she is attempting to redesign her behavior course with trauma informed care and responsive classroom, which is a focus in Virginia schools. She also enjoys participating in professional learning that is developed by individuals with disabilities. For instance, after the interview, she planned to attend "Shattering Myths," an autism webinar created by individuals with autism.

As a certified educator for Seesaw, Flipgrid, and NearPod, recertification is a regular part of Participant #9's professional learning. In addition, he has attended virtual conferences such as the International Society for Technology in Education (ISTE) and Society for Information Technology and Teacher Education (SITE), along with attending the regional technology conference in his state. He also maintains an active presence on Twitter, as well as reading current research in his content and other interest areas. He would like to branch out in the coming year and attend different professional learning than he has in the past, such as the South by Southwest Conference and Festival in Austin, Texas, which converges film, music, and technology.

Participant #10 states that the university provides "extensive opportunities to learn" not only through the university technology made available to instructors and students but also the professional development offered on such topics as online learning. She would like to add the Kaltura video cloud platform, available through the university, more comprehensively to her courses in the coming year. The only improvement that Participant #10 suggested is more frequent rotation in hardware updates.

Eighteen months from retirement, Participant #3 plans to continue her service work among the department and university, including mentoring new faculty and doctorate students. She is also finishing a book series.

Leadership

Administrations at the department, school, and university levels have multiple agendas that fill their schedule daily. Common among the teacher educators' comments was a lack of support or interest for technology integration through the teacher preparation program. Findings suggest that TPP leadership lacks a shared vision within the program that motivates and inspires the teacher educators. Several teacher educators have filled the leadership gap by collaborating within their departments or schools.

Institutional Support

Very little support exists for technology integration through the teacher preparation program at Participant #2's institution. The outgoing college dean has "in effect, killed technology in our university." Participant #2 has filled this leadership gap by not only "inspiring" teacher educators to use technology but also encouraging students to ask instructors to utilize technology. The university provides training through the Faculty Development Center, but few topics focus on technology.

Participant #1 feels that "we have huge support at all levels. Our department chair is very willing to do what he can to help us teach our candidates," and provides no recommendations for improvement. She provides the current education building renovation as an example of the positive support. The department chair gathered several professors together and asked what they would like in the new building. In an effort to create a classroom environment similar to the teacher candidate's future classroom, the professors requested a more mobile classroom. Though

not all items were approved, Participant #1 is excited about the new updated classrooms. A strong collaborative atmosphere also exists throughout her department. In addition to conducting research and presenting at conferences, often ad hoc committees form over lunch or hallway conversations.

Participant #4 feels that her department is "decentralized," allowing instructors to teach "how they think it will serve their students best…." The College of Arts and Sciences does require instructors to use Moodle, the institution's LMS. The small private college atmosphere allows individuals to connect based more on modality or a relevant topic, which Participant #4 refers to as cross-pollination. For instance, an impromptu group may develop to discuss online learning strategies or another relevant topic. The institution holds an event in the spring called West by Midwest in which anyone can sign up to share for 10 minutes. It is an informal time for sharing and collaboration across the institution. Though Participant #4 is quick to praise the technology support staff, she also states that few have every taught. She explains, "…having technology specialists that can think like a teacher would be really, really helpful."

Participant #8 applauds the college's strong technology support team. When she integrated the Hypothesis annotation tool, a tech support team member trained in the tool and assisted in launching it in the LMS. She mentions several other examples of the support provided by the tech team. Additionally, the Center for Teaching Excellence provides a community of practice setting, every two weeks throughout a semester. The university also supports instructors through professional development financing. Throughout this support, Participant #8 remarks that one way that it could be improved is increased time to participate in professional learning. She states, "…our classes are getting bigger and loads are getting heavier… if we had another

full-time instructor, … that would be helpful." Collaboration exists within the department, but not between departments.

As an institution known for technology, Participant #9 feels that his institution's department, college, and university provide ample support. In addition, there is a highly collaborative environment throughout the faculty. He admits collaboration decreased during 2020-2021, since collaborations frequently resulted from informal hallway conversations and also where some of the best ideas begin.

Collaboration

Participant #5 described a department that is "largely collaborative, … brainstorming with another person, …we more or less support and help each other, …." The IT Department, stretched like many others, rarely responds to requests in person, but rather sends a video with technical support guidance. As part of a small private university, Participant #5 stated "I'm not above reaching out to our Vice President, Academic Dean, and even the President." However, what makes her department unique is the extensive online programs that includes students from all over the world. She was quick to point out not all departments have such extensive online programs. Though overall, she is satisfied with the support, Participant #5 did note that for the 10 years she has been at the university she has requested improvements to the bandwidth to no avail.

Participant #7 states that limited support provided through her department is compensated by the collaboration among the instructors. At the school level there are occasional GAs to provide technology support to instructors but not every year. The university provides Educational Technology Services, which primarily provides professional learning in various topics.

Collaboration within the department is evident as Participant #10 conveyed the various opportunities in which colleagues work together, both individually and as a group. The department head, a technology professor within the department, encourages this collaboration by often working with the instructors and encouraging instructor use of Webex Teams. If several instructors ask a similar question, a session on that topic may be scheduled for any who would like to attend. The department also recently received a state grant to develop an online teaching endorsement, called the Online Teacher Academy, which also requires frequent collaboration among the instructors. This endorsement will benefit schools throughout Arkansas as the state now hires teachers specifically for online teaching, rather than a classroom teacher needing to work in a blended format.

Suggestions for Improvement

A variety of teacher educator suggestions were provided with some commonalities. One common thread among the teacher educators who more actively use technology was the suggestion for additional follow-through training for current university technology. The university purchases technology and then may provide initial training, but provides no follow-up or continuing training. The result is that university funds pay for unused technology.

An example was provided by Participant #2, who was quick to indicate how support could be improved at the institution. First, training for the technology that already exists at the institution. Without hesitation he mentioned four technology tools that the institution currently possesses but very few know how to use. Initial training may be provided, but very little, if any follow-up or secondary training is provided. The second suggestion is a better mentor network or network of colleagues among instructors to build a "culture of learning, a culture of professional

development." A mentor network could also aid in follow through for trainings offered through the university.

Participant #6 states that her department and university are receptive to requests and provide opportunities throughout the year such as the Campus Enhancement Day (offered each semester) and the ongoing workshops from the Center for Learning Innovation and Collaboration (also known as Click). Her suggestion to improve support is increased retention of personnel in order to "build the rapport for why you need things and not have to re-explain to a new person…." Another suggestion is an improved evaluation process for technology purchases, referencing the Apple iPad example. She continues by stating that part of this process should include whether or not current university technology is being used effectively. "There's a real need for mentoring digital pedagogy amongst higher education faculty. That's not just my university, I've seen that elsewhere as well. …[professors] don't know how to use email. How do you become a professor and not know how to use email blows my mind." Participant #6 encourages support that would be ongoing and not just "one and done."

Summary

The data from the experiences of 10 teacher educators integrating technology in teacher preparation programs revealed seven themes and seventeen codes. The first four themes and nine codes emanate from the research questions, which were developed from the Teacher Educator Technology Competencies #1 (TETCs). These data show teacher educators who utilize a variety of paths in the evaluation of technology. Regardless of the path, technology evaluation often associates with the alignment of content, pedagogy, and technology. Teacher educators demonstrate this alignment in their courses by modeling, teaching about technology, and handling technology issues. TPACK elements are evident throughout the participant's

experiences though TPACK was not specifically discussed during the interviews. The teacher educators also acknowledged that technology enhances education through information currency, engagement, and versatility

The technological skills of every educator were put to the test during the COVID-19 pandemic. Despite the adjustments made, there are lasting effects, both positive and negative. For many educators, the pandemic required extra professional learning as in-person classes were converted to an online format. However, many teacher educators "stepped up to the plate" and provided professional learning that their colleagues needed at this critical juncture, showing that leadership can come from even the most remote corners. Teacher educators have also provided the leadership to promote technology integration throughout teacher preparation programs, especially when leadership is lacking from the department, college, or university level.

CHAPTER 5: DISCUSSION

The purpose of this qualitative, phenomenological study was to explore how and to what extent teacher educators evaluate, align, and demonstrate technology within teacher preparation programs. As models of 21st century educators, teacher educators should exemplify technology integration in the classroom and throughout teacher preparation programs, but this is not always occurring (Clausen, 2020; Ottenbreit-Leftwich et al., 2015; Stoke-Beverley & Simoy, 2016). Institution leadership needs to collaborate with teacher educators to provide a program-wide, program-deep, and technology-infused teacher preparation program (TPP). Using the Teacher Educator Technology Competency #1 (TETC) (Foulger et al., 2017), the present study found that teacher educators' knowledge, skills, and attitudes regarding the evaluation, alignment, and demonstration of technology in their courses vary. This study has implications for policy and practice in the realms of teacher educator technology competencies, technology infusion throughout teacher preparation programs, professional learning, and leadership.

The following questions guided this study:

1. What are the experiences of teacher educators utilizing technology within a teacher preparation program?
2. How do teacher educators evaluate content-specific technologies for teaching and learning?
3. What approaches do teacher educators use to align content, pedagogy, and technology?
    a. How do teacher educators demonstrate this alignment to pre-service teachers and teacher candidates?

To frame this discourse, the participant backgrounds and their possible influence on a teacher educator's technology integration will be discussed. In the context of the teacher educators' technology integration experiences and the Teacher Educator Technology Competency #1, the research questions will then be examined. The data suggest that research question 2, the evaluation of technology, closely relates to research question 3, the alignment of content, pedagogy, and technology. Additionally, the teacher educator's level of evaluation and alignment of content, pedagogy, and technology influenced research question 3 (a), the demonstration of technology. The findings also suggest that the COVID-19 pandemic not only served as a catalyst for increased technology integration among teacher educators, but also resulted in benefits beyond the pandemic. Professional learning and leadership conclude the discussion by considering the effect of these areas on teacher educators' technology integration experiences in teacher preparation programs. The chapter concludes with the limitations of the study, implications for practice, and recommendations for future research.

Participant Backgrounds

Though all the participants have some level of technology literacy, the depth (the extent of their knowledge, skills, and attitude) of the technology literacy varied among participants. The five younger participants under 60 years of age, who are considered Generation-X or Millennials, tended to have more depth in technology literacy. Four of the five participants who were over 60 years of age, considered Baby Boomers, possessed technological literacy, but not at the same level. Prior research regarding adult generational mix evidences similar tendencies (Holyoke & Larson, 2009). Baby Boomers, many of whom are approaching retirement, differed from Generation-X (Gen-X) and Millennials in their readiness to learn, orientation to learning, and motivation learn.

In this instance, Davis' Technology Acceptance Model (TAM), which has seen numerous variations over the years, is also applicable (Marangunić & Granić, 2015). Based on the theory of reasonable action (TRA) and theory of planned behavior (TPB), TAM attempts to evaluate the factors affecting an individual's technology use. Venkatesh's (2000) adjustments to TAM added anchors and adjustments in four categories: external predictors (technology anxiety, self-efficiency, etc.); validity factors from other theories; contextual factors (gender, cultural diversity, etc.); and usage (actual usage of technology, attitude toward technology). The contextual factors of gender and cultural diversity brought two additional perspectives to the participant backgrounds. First, there were eight women and two men in this study. This by itself did not determine the teacher educator's technology integration experiences. However, the two men did possess high technology integration levels, as one focused solely on educational technology and the other focused on math and computer science. Nevertheless, gender was the not the sole determinant of technology integration levels. Two of the three female participants with high levels of technology integration primarily teach in the language arts.

From the cultural diversity perspective, several cultures were represented among the participants. Several participants came from rural areas. The data suggest this factor is relevant as a participant from a rural state presented at the National Rural Education Association in November 2021. Other participants currently reside in metropolitan areas. One participant is native Australian, and another is Hispanic, originally from Puerto Rico. The fact that seven of the participants' institutions were public and three were private may also affect the cultural atmosphere. Gender and cultural diversity's influence on teacher educator's technology integration could certainly be an area for future research.

Teacher Educator Technology Integration Experiences and TETC #1

The Evaluation of Technology

Focusing on research question 2 – How do teacher educators evaluate content-specific technologies for teaching and learning? – provided a window into the extent of technology integration and literacy within a teacher educator's classroom. The participants with higher levels of technology literacy not only evaluated technology but also used this as an opportunity to align content with pedagogy as well as model and teach about technology in the classroom. The struggle is not the particular framework or standard used (there were several represented among the participants), but the need to provide the pre-service teachers and teacher candidates research-based guidelines for their technology evaluation. In similar findings, Foulger (2020) supports the use of research-based guidelines by TPP leadership when creating a technology infused program. Teacher educators are leaders and models to the future generation of teachers and should therefore exemplify the use of technology integration in the classroom (Slykhuis et al., 2020; Stokes-Beverly & Simoy, 2016).

Though some teacher educators stated they did not utilize a specific framework or model to evaluate technology, they did utilize a self-developed system when evaluating technology to align with content and pedagogy. Most of these particular participants were Baby Boomers. Holyoke and Larson's (2009) research suggests that Baby Boomers' orientation to learning originates from a joy of discovery and personal gratification. In their study, the participants used what worked for their purposes not realizing there was a "method to [the] madness" (p. 18). Though not necessarily a research-based system, this at least points pre-service teachers and teacher candidates to the need to utilize some type of evaluation process for the selection and use of technology. An alternative would be for teacher educators to utilize a framework or model

such as TPACK, which "attempts to identify the nature of knowledge required by teachers for technology integration in their teaching, while addressing the complex, multifaceted and situated nature of teacher knowledge" (Mishra & Koehler, 2006).

Practicality and accessibility, which were also mentioned by several participants, relate to two of the core variables of TAM: perceived ease of use and perceived usefulness. Granić and Marangunić (2019) recently conducted a study regarding TAM in an educational context; their findings suggested that these two core variables affect the "acceptance of learning with technology" (p. 2573). The current study's data indicate that multiple participants utilized practicality and accessibility, some in combination with their chosen framework or standards. This indicates the need for not only utilizing a framework, such as TPACK (Mishra & Koehler, 2006) or Triple E (Kolb, 2017), but also considering factors such as practicality and accessibility in order to evaluate technology and align with content and pedagogy.

The lack of a research-based technology evaluation process among teacher educators presents a foundational yet salient issue regarding the technology experiences of teacher educators. Mishra and Koehler (2006) state, "[The] knowledge of technology becomes an important aspect of overall teacher knowledge." This lack of a technology evaluation process also references what the Horizon Report's 2019 Higher Education Edition stated as a wicked challenge, which is "improving digital fluency" (Alexander et al., 2019, p. 14). The TETCs (Foulger et al., 2017) provide a pathway for teacher educators to build the knowledge, skills, and attitude of a 21st century educator. An effective, research-based evaluation of technology process is just one step in this journey.

Aligning Content, Pedagogy, and Technology

Research question 3 states, "What approaches do teacher educators use to align content, pedagogy, and technology?" As previously stated, aligning content, pedagogy, and technology relates to the evaluation of technology. The data suggested that part of the evaluation process (research question 2) includes aligning the content and pedagogy. This finding should not be surprising when considering the frameworks used by the participants. For instance, the Triple E framework represents engagement, enhancement, and extension. If one reviews this framework, the alignment of content, pedagogy, and technology is seen. Reviewing other frameworks such as 4MAT (McCarthy & McCarthy, 2006) and Universal Design for Learning (Meyer et al., 2014) provides similar results. In this instance, it appears that the evaluation of technology is highly correlated with aligning content and pedagogy, regardless of the framework used for evaluation. This reiterates the need for teacher educators to utilize research-based frameworks for the evaluation of technology for use within TPP courses.

Data also revealed that those teacher educators that utilize frameworks or standards for technology evaluation integrate technology not only within their content area but also through productivity and personal areas, such as utilizing tools for more efficient assessment or templates for consistent data collection. Pre-service teachers and teacher candidates need to see the enhancement that technology provides through additional versatility, expanded engagement, and information currency, all of which were demonstrated by the research participants. These practices align with the Society for Information Technology and Teacher Education (SITE), which states that consistent demonstration of technology through a TPP will produce teacher candidates ready to enter their classroom with 21st century skills (SITE, 2021).

Another key finding of this study is that no participant specifically mentioned the TPACK framework. However, varying participant experiences throughout the data evidence various aspects of TPACK, such as technological content knowledge (TCK), technological pedagogical knowledge (TPK) and possibly even technological pedagogical content knowledge (TPACK). It is also possible that participants are aware of TPACK but did not mention it in the interview. Prior research suggests that teacher educator's unfamiliarity with TPACK is a potential issue (Voithofer, 2019). TPACK language is not only found in several TETCs, but also evident in the CAEP standards, both important areas within TPPs. Voithofer's findings revealed that over 60% of the teacher educators surveyed either had not adopted or were not aware of the TPACK framework. Pre-service teachers and teacher candidates are not trained to the CAEP standards referencing TPACK in programs where teacher educators are not aware or have not adopted the framework.

Demonstrating the Alignment with Technology

Participants' demonstration of the alignment of content, pedagogy, and technology varied. According to many experts, setting the example, or modeling, is where leadership begins (Blanchard & Hodges, 2003; Kouzes & Posner, 2002; Maxwell, 1997). Hogg and Yates (2013) discussed a unique quality of teacher educators in that they concurrently model the skills they are teaching, which is evident in the demonstration of the alignment of content and pedagogy with technology. Modeling such skills aligns with the data in the present study as multiple participants recounted working through the technology evaluation process with students. For many research participants, this also provides insight into the enhancements that technology provides, which the research participants recognized as information currency, engagement, and versatility. The findings revealed multiple examples such as relevant and current information "at their fingertips"

to “expanding the walls of [the] classroom” by teacher candidates collaborating with teachers in Asia, as well as mentoring local high school students.

In addition, the versatility that technology affords was demonstrated through multiple content areas with a variety of resources used by the study participants (see Appendix F). These 75 resources were mentioned throughout the interviews and provide a sampling of the technology used, and in many cases modeled, by the study participants. Many resources, such as the Google Suite and Classroom, were utilized by more than one participant. This is likely because many K-12 schools utilize Google and its many tools. This also applies to resources such as Schoology, Flipgrid, Flocabulary, Hypothesis, Kahoot, and most of the iPad apps. Research has shown the importance of teacher education programs partnering with local school districts (Williamson & Moore, 2020). With these partnerships, the study participants are therefore attempting to prepare their pre-service teachers and teacher candidates with the contextual knowledge potentially needed for their future positions with local school districts. The relevancy of contextual knowledge and the need for preservice teachers and teacher candidates to be contextually prepared for their future positions aligns with the data (Mishra, 2019; Starkey, 2010; Warr et al., 2019).

Many websites were content resources, such as Common Sense Media, Kansas State Department of Education Top Math Resources, The Fred Rogers Center, and the University of Florida Literacy Institute. Media production was also frequently discussed by participants, as video creation was a necessity with the advent of online learning during the COVID-19 pandemic. Multiple learning management systems are also listed, which are used by both higher education and K-12 education. Finally, numerous productivity applications are listed. These should not be overlooked. As Participant #9 discussed in the data analysis, productivity

applications, such as Floop, "free me up to do more … to help the students, … spend more time planning, and provide more substantive feedback…." This participant has not just *integrated* technology into his courses but has *infused* it. His students, future teachers, witness this infusion and the benefits derived from it. Data suggest that these future teachers will duplicate the technology infusion he has modeled (Kalonde & Mousa, 2016).

Holyoke and Larson's adult generational mix (2009) not only applies to teacher educators but also the pre-service teachers and teacher candidates. Participant #9 provided key insight into this topic when he discussed modeling and teaching about technology. He stated, "there's a little bit of a disconnect [when] they [students] don't always see how the technology applies to a subject that they might be teaching," which he indicated is due to "the instructor and their comfort and confidence level with technology." This same statement applied when technology issues arose in the classroom. Many participants shared the need to always have a back-up plan in case technology did not cooperate (sometimes more than one back-up plan).

Other participants took technology issues a step further by creating a learning experience for pre-service teachers and teacher candidates. In this instance these research participants are utilizing several elements of Knowles' core andragogical principles including the learner's need to know, the readiness to learn, and the orientation to learn (Knowles et al., 2015). For the future teachers in the classroom, some have, and some have not, experienced the technology issues that arise in a classroom. Knowles core andragogical principles are evident because these future teachers *need to know* how to troubleshoot technology issues in their future classrooms. The technology issue within the students' course provided an *orientation to learning*, seeing a real life need for the application of the required skills. This also resulted in a *readiness to learn* because the students' learned how to troubleshoot when troubleshooting was needed.

The demonstration of technology for teacher educators is much more than showing students how technology functions. Many of this study's participants have shown that modeling is "…a thoughtful interweaving of …technology, pedagogy, and content…" (Mishra & Koehler, 2006, p. 1029), the essence of TPACK. For many teacher educators, it is a way of life.

Blessings in Disguise: A Discussion of the COVID-19 Pandemic

Early in 2020, the COVID-19 pandemic spread throughout the globe, creating a health crisis that shut down schools and transitioned education to an online format for the remainder of the 2019-2020 school year. Burke (2018) would likely call this sudden, organization-wide change transformational or revolutionary. In the fall of 2020, K-12 schools and higher education returned to multiple formats including online, blended, and face-to-face, based on the context of their community. With little surprise, those participants who evidenced the highest technology integration levels through their knowledge, skills and attitudes experienced the smoothest transition during the initial transition. For many of these participants, who were already using the institution's learning management system (LMS) to its fullest, the primary change from on-campus to online courses was a face-to-face format to a Zoom video format. Participant #6 recounts her explaining to a concerned on-campus student the differences that would exist between the on-campus course and the forthcoming online version:

> You're still going to continue everything you did previously. It's all there, it's always been there online. The only difference is instead of …coming on the campus . . . log onto Zoom. . . if it makes you feel any better, I'll connect the swivel and walk around my room [so it will be just like the classroom].

This also evidences another adjustment, even for those participants who were accustomed to online teaching, which was the transition from an asynchronous to synchronous format. Most

participants shared that they were accustomed to an asynchronous online learning environment, in which there was no required scheduled class meeting each week. However, to provide an atmosphere closer to the on-campus experience, many institutions required instructors to utilize some type of synchronous format. This may be every scheduled class meeting online, one of two classes per week, or possibly every other week. The frequency depended on the guidelines (if any) provided by the institution and the class context.

Evolutionary or transactional change (Burke, 2018) also occurred during the pandemic. These were the adjustments that the research participants made, and are still making, during that period. Many participants recounted the additional depth in utilizing the tools and resources that they were already using prior to the pandemic, showing their readiness to learn, orientation to learning, and motivation to learn (Knowles et al., 2015). In addition, new tools were added such as Participant #3's account of the GoReact video assessment tool utilized for teacher candidates' field experiences, which proved extremely successful. Participant #3 is considering utilizing this "blessing in disguise" as a hybrid assignment in the future, part GoReact and part in-person. This example illustrates how situational differences, part of Knowles' andragogical model, can affect adult learning. Participant #3 was not resistant to technology but until the situation presented itself for her to utilize GoReact, she did not see the need for it. Several participants also provided examples of modifying pedagogy to align with the new context, which references the importance of contextual knowledge from the TPACK framework (Mishra, 2019; Warr et al., 2019).

Through the COVID-19 pandemic, the statements such as "I can't wait to get back to normal" have been undoubtedly heard by most individuals. However, the opportunity emerging from the COVID-19 pandemic is the catalyst for increased technology integration. Would we want to go back to pre-pandemic levels of technology integration? Why would we want to go

back? Consider Participant #10's example of her colleagues who only taught face to face, did not take advantage of the institution's LMS and were "just at a total loss as how to do it [teach online]." Participant #2 also provided an example of assisting fellow teacher educators. These individuals wanted to record lectures for their online courses and had no idea how to create a video. Though not an easy process, Participant #2 assisted his colleagues over a 12-month period and states, "I think my faculty are actually at a point now where they're using the technology more wisely than they did a year ago.... my whole goal is that students will never have to watch a one-hour talking head ever again…."

As exemplary models for 21st century teaching, the examples mentioned in the previous paragraph should not exist among teacher educators in a teacher preparation program. According to Tondeur et al. (2019), teacher educators are gatekeepers or individuals that "moderate the extent and nature of educational engagement with new technologies" (p. 1194). As "gatekeepers" to the next generation of teachers, teacher educators have an obligation to model 21st century teaching, including technology integration, so that the next generation of teachers enter the classroom prepared with 21st century skills.

The present study's findings advance the case for utilizing the TETCs within teacher preparation programs. Research has shown that a single technology class does not provide sufficient modeling of technology (Slykhuis et al., 2020). The difficulty is planning the change. Slykhuis et al. (2020) suggest three phases: short-term support, mid-term support, and long-term support. During short-term support, teacher educators' current technology literacy is evaluated, which provides guidance for future professional learning within the context of the individual and institution. During mid-term support, teacher educators, now with increased technology literacy, begin modifying courses to create meaningful student learning experiences through technology

integration. Finally, long-term support requires the School or College of Education to modify policies to support technology infusion through the TPP. At this post-pandemic period, TPP leadership can sustain the momentum through short term change. A change such as this also needs a champion, which will be discussed further in leadership.

Professional Learning

The participants' professional learning experiences aligns with Knowles Andragogy in Practice model (Knowles et al., 2015). Their goals and purposes for learning varied from institutional growth, individual growth, and societal growth. Additionally, the differences in subject matter, the individual learner, and the situation or context determine the type of professional learning. Finally, the six core andragogical principles illustrate the participant's professional learning choices. For instance, as teacher educators the participants all display a self-concept of learning that is autonomous and self-directed. Additionally, the motivation to learn was evident in all the participants, though more so in some than others. Their orientation to learning exhibited both contextual and problem centered aspects.

A key finding recognized throughout the participants' professional learning is the personalized aspect. Personalized professional learning aligns with the andragogical principle of the learner's need to know or the why, what, and how (Knowles et al., 2015). The adult learner needs to understand the content relevancy; otherwise a lack of motivation to learn may exist. Though many participants attended professional learning at their institutions, most professional learning took place outside of the institution. Forefront in this outward focus was an involvement in social media by several participants. The participants recounted how through their social media network they are not only able to remain current with recent research, but also maintain a global professional network personalized in their areas of interest. This also applied to

networking at conferences. Though conferences were offered virtually during the pandemic, some participants, such as Participant #1, are eager for the "personal connection" provided by in-person conferences.

The participants recounted multiple examples of collaboration throughout their department and sometimes across departments. This finding suggests the collaborative nature of professional learning that naturally exists among teacher educators. In this instance, one of the four guiding principles created by the Office of Educational Technology relates to this finding. It states that higher education schools should "build sustainable program-wide systems of professional learning for higher education instructors to strengthen and *continually* refresh their capacity to use technological tools to enable transformative learning and teaching" (Stokes-Beverly & Simoy, 2016, p. 9, emphasis added). A notable word in that statement is *continually*. Professional learning is a continual learning process, not a "one and done" training, which is the format of much higher education professional learning. Higher education needs to rethink the format for professional learning from "one and done" to a continual learning format, whatever that may look like. Hadar and Brody (2018) found in their 7-year study of learning communities that teacher educators possessed increased professional self-confidence (Knowles' self-concept of the learner), willingness to implement new skills (Knowles' orientation of learning), a sense of belonging, and a commitment to improved teaching (Knowles' motivation to learn) (Knowles et al., 2015). Participant #2 provided a relevant and current example of continual professional learning. He recounted the first twelve months of the pandemic as he provided professional learning to instructors not prepared for digital learning. His statement, "…they're using the technology more wisely than they did a year ago…" reveals the saliency of *continued* professional learning.

TPP leadership could build on the collaborative atmosphere that naturally occurs among teacher educators through the use of learning communities, lesson study, mentoring, or other continual professional learning formats (Hadar & Brody, 2018; Otero et al., 2005; Weaver et al., 2021). As previously stated, a sustained, continual program contributes to more permanent results. Additionally, providing contextualized professional learning increases the teacher educator's readiness and motivation to learn.

Leadership

As stated earlier, "The truest test of credible leadership is what leaders pay attention to and what they do" (Kouzes & Posner, 2002, p. 83). The data revealed that TPP leadership generally provided teacher educators the needed technology tools. The findings also indicated that the majority of the participants' TPPs do not have program-wide, program-deep technology infusion. Most TPP leadership looks to the teacher educators to take the initiative for technology integration in and through the teacher preparation programs, which is not sufficient for program-wide, program-deep technology infused TPPs. The key to creating such programs is transformational leadership and sustained support (Clausen, 2020).

The COVID-19 pandemic has provided the catalyst to begin the change. The question is whether TPP leadership will *pay attention* to this opportunity to create program-wide and program-deep technology infused TPPs and *what they do* about it. The present time is ripe to assess teacher educators' current technology competency and continue the forward movement by planning purposively professional learning, which can exist in multiple formats. As TPP leadership proceeds through the short-term support, they can begin to look toward the mid-term support, which requires providing resources for course development (Slykhuis et al., 2020). Teachers of technology education may actually see themselves transitioning from full time

teaching with pre-service teachers and teacher candidates to less time teaching and more time providing technology integration assistance to teacher educators.

Many participants provided exactly this type of assistance during the pandemic and showed leadership within their department by initiating personal mentoring or collaborative professional learning with colleagues. These individuals could be the champions that support the change to a technology infused TPP in their institution. Borthwick et al. (2020, p. xxvi) state, "Champions for technology infusion are concerned with continually advancing a long-term change effort." They evidence strong communication skills, problem solving skills, share and promote the vision for change, and energize the change through innovation.

At some point, TPP leadership need to examine the culture of the Colleges/Schools of Education. Putting policies in place that create a culture of technology infusion through the program helps to mitigate issues caused by changing leadership, which was noted by participants. One participant stated that the previous dean did not provide support for technology integration. With a new dean entering the picture, the participant did not know what the future might bring to the department. Another participant expressed frustration at changes in leadership, which creates a need to build rapport in order to discuss the future direction of the program. When department leadership was lacking, one participant took the initiative by assisting colleagues with technology-related professional learning. A key to resolving this issue is changing the culture of the TPP, which was the long-term support discussed by Slykhuis et al. (2020). Again, this necessitates a champion who is willing to commit time and effort to each phase of the process.

Creating a teacher preparation program with a program-wide, program-deep technology infusion is not a one-size-fits-all model. One participant shared that, though technology is

integrated throughout the TPP, students still have at least one stand-alone technology course. Foulger et al. (2019) references the various factors to consider when transforming a TPP, including contextual considerations. Another option for TPP leadership could also be the TPACK Leadership Diagnostic Tool, designed to provide guidance to leaders during transformational change (Graziano et al., 2017).

Over the last nearly two years, education has seen both transformational and transactional change. TPP leadership should utilize this impetus to create a shared vision within their programs by enlisting champions of technology infusion to challenge the process and create a new TPP culture. A culture where teacher educators are models of 21st century digital skills, which encourage and enable pre-service teachers and teacher candidates to enter their future classrooms ready use technology as "digital pencils in the classroom."

Implications for Practice

This qualitative phenomenological study used the Teacher Educator Technology Competency #1 (TETCs) to explore how and to what extent teacher educators evaluate, align, and demonstrate technology within teacher preparation programs. The research data findings contribute to existing research through a rich narrative from teacher educators regarding their knowledge, skills, and attitudes integrating technology within TPPs. Additionally, there is indication of a generational "passing the baton" of the older generation to the new generation of teacher educators, whose depth of knowledge, skills, and attitudes toward technology integration tends to be deeper.

Though the COVID-19 pandemic was a traumatic global event, it provided a catalyst for technology integration throughout education. Teacher educators and teacher preparation program leadership should continue to foster the momentum gained through that time. Sustainable change

is possible through multiple factors including but not limited to technology infusion champions, TPP course modifications, teacher educator focused professional learning to promote digital fluency, and collaboration throughout Colleges/Schools of Education. In their findings regarding the pandemic, Krishnamoorthy and Keating (2021) suggest similar changes throughout higher education. They state that to envision the future of higher education a paradigm shift is needed. Though the face-to-face learning environment will not disappear any time soon, teacher educators should be prepared to seamlessly teach in either the face-to-face or digital learning environments.

TPP leadership needs to come alongside the teacher educators to understand their professional learning needs, which begins by assessing the teacher educator's current digital literacy. By completing such an assessment, leadership can develop meaningful and sustained professional learning focused on technology integration for teacher educators, which is a first step to technology infused teacher preparation programs. The participants stated this was a clear issue within the professional learning at their institutions in which technology was provided with little or no training. Beyond initial technology, continued training, including assessment of the technology's use, should be utilized. The Teacher Educator Technology Competencies (Foulger et al., 2017) support teacher educators' professional learning and provide a guide for TPP leadership in program and professional development.

Finally, an opportunity exists for teacher preparation program leadership and teacher educators to utilize the research findings as a motivation to work together to develop teacher preparation programs that infuse technology program-wide and program-deep. Organizations such as CAEP, ISTE, and the U.S. Department of Education's Office of Educational Technology have provided guidelines or standards for a technology-infused TPP (CAEP, 2013; ISTE, 2018;

Stoke-Beverley & Simoy, 2016). However, many TPPs have not created such programs. A research participant summed the situation up well when she stated,

> …technology has evolved so quickly, and it will continue to do so, that our standards and our law … have not kept up…. Education in general hasn't kept up with research, in life, in the world, …. We typically are still doing things the way we did it a hundred years ago.

As 21st century educators, teacher educators and TPP leadership should latch onto this opportunity to move toward teacher educators that possess digital fluency within technology infused teacher preparation programs.

Recommendations for Future Research

Further research is warranted regarding teacher educators' technology literacy levels. As recommended by the Horizon Report (2019), teacher educators should possess technology fluency in order to provide the necessary training to the next generation of teachers. Longitudinal research regarding preservation of pandemic-acquired technology skills is also merited. Additional research could also be conducted to explore teacher educators' attitudes in the post-pandemic period toward technology, possible using TAM or other frameworks.

A study in an andragogical context considering the generational factors of teacher educators that may influence their knowledge, skills, and attitudes towards the integration of technology within teacher preparation programs could provide insight for TPP leadership. Taking it a step further, the TAM contextual factors of gender and cultural diversity's influence on teacher educator's technology integration could also be considered.

The TETCs also provide multiple opportunities for additional research. First, quantitative research regarding possible strong correlations among TETC #1's criteria. Second, research

regarding the development of teacher educator professional learning coordinated with the TETCs, whether that be digital badging, learning communities, or some other format. Last, additional qualitative and quantitative research is warranted to explore the remaining 11 TETCs and their current implementation among teacher educators.

The data also suggest the potential for future research regarding the TPP leadership attitudes regarding the development of a TPP with program-wide, program-deep technology infusion. Leadership factors contributing to technology infusion within a teacher preparation program is also warranted.

Limitations of the Study

The purpose of this study was to explore the technology integration experiences of teacher educators in teacher preparation programs. As teacher educators were solicited through email to participate in this study, many research participants possessed an interest in technology integration to some extent, which may have influenced their initial interest in the study. The research data may have differed with teacher educators exhibiting different levels of interest in technology integration.

The teacher educator technology experiences are based on interviews with the participants and not direct observation by the researcher. The experience provided to the researcher are therefore based on the participant's perceptions of those experiences. Lastly, the researcher assumes that the experiences and other information by the participants to be truthful.

Conclusion

The experiences of teacher educators utilizing technology in teacher preparation programs revealed not only a need for technology infusion among teacher preparation programs, but also the need for technology standards for teacher educators, such as the Teacher Educator

Technology Competencies (Foulger et al., 2017). Focused TETC professional learning is a first step in achieving digital fluency among teacher educators. TPP leadership have a pristine opportunity to utilize the pandemic-initiated impetus for technology integration and move forward to technology infusion throughout their programs. Teacher educators throughout TPPs are ready to champion the cause of technology infusion. Working together, TPP leadership and teacher educators can provide pre-service teachers and teacher candidates the knowledge and skills to enter their future classroom as 21st century educators.

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APPENDIX A. TEACHER EDUCATOR TECHONOLGY COMPENTENCIES WITH ACCOMPANYING CRITERIA

1. Teacher educators will design instruction that utilizes content-specific technologies to enhance teaching and learning.
a) Evaluate content-specific technology for teaching and learning. b) Align content with pedagogical approaches and appropriate technology. c) Model approaches for aligning the content being taught with appropriate pedagogy and technology
2. Teacher educators will incorporate pedagogical approaches that prepare teacher candidates to effectively use technology.
a) Model using technology for accessing, analyzing, creating, and evaluating information. b) Assist teacher candidates with evaluating the affordances of content-specific technologies to support student learning. c) Assist teacher candidates with the selectin and use of content-specific technologies to support student learning. d) Facilitate opportunities for teacher candidates to practice teaching with technology.
3. Teacher educators will support the development of the knowledge, skills, and attitudes of teacher candidates as related to teaching with technology in their content area.
a) Support teacher candidates' alignment of content with pedagogy and appropriate technology. b) Provide opportunities for teacher candidates to reflect on their attitudes about using technology for teaching and for their own learning. c) Provide opportunities to develop teacher candidates' efficacy about using technology in teaching.
4. Teacher educators will use online tools to enhance teaching and learning.
a) Communicate using online tools. b) Collaborate using online tools. c) Design instruction using online tools. d) Assess teacher candidates using online tools.

5. Teacher educators will use technology to differentiate instruction to meet diverse learning needs.
a) Design instruction using technology to meet the needs of diverse learners. b) Demonstrate using assistive technologies to maximize learning for individual student needs. c) Model using technology to differentiate learning in teaching and learning. d) Provide opportunities for teacher candidates to create learning activities using technology to differentiate instruction.
6. Teacher educators will use appropriate technology tools for assessment.
a) Use technology to assess teacher candidates' competence and knowledge. b) Model a variety of assessment practices that use technology. c) Provide opportunities for teacher candidates to use appropriate technology for assessment.
7. Teacher educators will use effective strategies for teaching online and/or blended/hybrid learning environments.
a) Model online and blended learning methods and strategies. b) Provide opportunities for teacher candidates to practice teaching online and/or in blended/hybrid learning environments.
8. Teacher educators will use technology to connect globally with a variety of regions and cultures.
a) Model global engagement using technologies to connect teacher candidates with other cultures and locations. b) Design instruction in which teacher candidates use technology to collaborate with learners from a variety of backgrounds and cultures. c) Address strategies needed for cultures and regions having different levels of technological connectivity.
9. Teacher educators will address the legal, ethical, and socially-responsible use of technology in education.
a) Model the legal, ethical, and socially-responsible use of technology for teaching and learning.

b) Guide teacher candidates' use of technology in legal, ethical, and socially-responsible way. c) Provide opportunities for teacher candidates to design curriculum following legal, ethical, and socially responsible users of technology.
10. Teacher educators will engage in ongoing professional development and networking activities to improve the integration of technology in teaching.
a) Define goals for personal growth in using technology. b) Engage in continuous professional development and networking activities promoting technology knowledge and skills. c) Support teacher candidates' continuous participation in networking activities to increase their knowledge of technology.
11. Teacher educators will engage in leadership and advocacy for using technology.
a) Share a vision for teaching and learning with technology. b) Engage with professional organizations that advocate technology use in education. c) Seek to influence the opinions and decisions of others regarding technology integration. d) Assist teacher candidates in becoming advocates for using technology to enhance teaching and learning. e) Support teacher candidates in understanding local, state, and national technology policies in education.
12. Teacher educators will apply basic troubleshooting skills to resolve technology issues.
a) Configure digital devices for teaching. b) Operate digital devices during teaching. c) Model basic troubleshooting skills during teaching. d) Find solutions to problems related to technology using a variety of resources.

Note. Adapted from Foulger, T. S., Graziano, K. J., Schmidt-Crawford, D. A., & Slykhuis, D. A. (2017). Teacher Educator Technology Competencies. *Journal of Technology and Teacher Education, 25*(4), 413-448. https://www.learntechlib.org/primary/p/181966/

APPENDIX B. EMAIL TO RECRUIT PARTICIPANTS

Participants are needed for research regarding experiences of teacher educators, those individuals who teach in teacher preparation programs, specifically at the undergraduate level. The purpose of this qualitative, phenomenological study is to explore how and to what extent teacher educators evaluate, align and demonstrate technology within teacher preparation programs. As leaders to the future generation of teachers, teacher educators should not only be exemplary models of technology integration in the classroom but also inspire a vision of the 21st century classroom within the teacher candidates, enabling them to duplicate the same skills in their future classrooms. This necessitates that teacher educators possess the skills to integrate technology, pedagogy, and content to enhance student learning.

If you have any questions, please email Cindy Edwards at cjedwar@bgsu.edu.

APPENDIX C. PARTICIPANT INTEREST FORM

Introductory Message

Thank you for your interest in this study. As the quantity and qualifications of participants are limited, the completion of this form is for recruitment only. Completion of the Participant Interest Form does not imply selection for the *Experiences of Teacher Educators Utilizing Technology Within a Teaching Preparation Program* study.

First Name– short answer

Last Name– short answer

Email– short answer

Phone Number– short answer

Age – drop down

Current Position – short answer

Years in Current Position – drop down

Years as a teacher educator (i.e. an educator who teaches in an undergraduate teacher preparation program)? – drop down

What content area do you teach as a teacher educator? - short answer

University of Current Position – short answer

Highest degree completed – drop down

Degree held in (be as complete as possible) – short answer

What occupation-related organizations are you currently a member (limit to three)? – Paragraph

What occupation-related certifications (or other recognitions) do you currently hold (limit to three)? – Paragraph

Concluding Message

Thank for your interest in this study. As the quantity and qualifications of participants are limited, the completion of this form is for recruitment only. Completion of the Participant Interest Form does not imply selection for the *Experiences of Teacher Educators Utilizing Technology Within a Teaching Preparation Program* study.

APPENDIX D. TEACHER EDUCATOR INVITATION TO PARTICIPATE EMAIL AND IRB CONSENT

Purpose

My name is Cynthia Edwards. I am a student in the Doctor of Education in Leadership Studies program. I am inviting you to participate as an interviewee in the Experiences of Teacher Educators Utilizing Technology Within a Teacher Preparation Program study. The purpose of this qualitative, phenomenological study is to explore how and to what extent teacher educators evaluate, align and demonstrate technology within teacher preparation programs. Those asked to be interviewed are teacher educators and have indicated their interest in participating in the study by their completion of the participant interest form.

Procedure

Your involvement in the study would consist of at least one approximately 1-hour interview scheduled through Zoom video conferencing and would be audio-recorded. The interview audio recording will be transcribed through Zoom. If upon analysis of the data the principal investigator determines a second interview is necessary, the interviewee will be contacted within 7 days of the first interview.

Confidentiality Protection

Personally-identifiable information is requested for research purposes and if needed for the follow-up interview. Numbers will be used to identify individual subjects, which will be utilized in the analysis of the data and for direct quotes, ensuring confidentiality. The principal investigator, Cynthia Edwards, and the project advisor, Dr. Patrick Pauken, will be the only two who can access the research data.

Potential Benefits

There is no direct benefit for your participation in this study except for your reflection as a teacher educator on the use of technology within your classroom. As a qualitative study this research may not only provide a rich and descriptive depiction of the teacher educator's teaching with and about technology within undergraduate teacher preparation programs but may also provide an indication of gaps, which could be filled through future professional learning. **Voluntary Nature and Potential Risks**

Participating is completely voluntary and you may discontinue your participation at any time. The risk of participating in this study is no greater than that in daily life. Deciding to participate or not will not impact any relationship you may have with Bowling Green State University.

The data from the interviews will be kept on the Bowling Green State University OneDrive with analysis completed in Microsoft Office Word and Excel, which the principal investigator (Cynthia Edwards) will have sole access. Data analysis will be completed on a Bowling Green State University laptop at the home of the principal investigator (Cynthia Edwards), which poses no additional risk to subjects.

Contact Information

If you have any questions concerning this study, you may contact Cynthia Edwards at cjedwar@bgsu.edu or 419-360-3393. Further questions may be directed to the project advisor, Dr. Patrick Pauken at paukenp@bgsu.edu or 419-372-9234. For questions regarding participant rights, contact the BGSU IRB (Bowling Green State University Institutional Review Board) at 419-372-7716 or irb@bgsu.edu.

Thank you for your time.

Documentation of Informed Consent (Please read carefully):

You are now deciding whether or not to participate in this research study and you agree to the following statements: I have had the chance to read this consent form and have the research study explained. I have had the chance to ask questions about the research project. My questions, if any, have been answered. I am prepared to participate in the research project described above. Clicking the following link to schedule my interview indicates consent to participate in the study.

To schedule the interview, please click this Doodle poll link and select the time that is best for you. You will receive an email reply with a Zoom video meeting link with the interview meeting time.

APPENDIX E. INTERVIEW PROTOCOLS

Researcher beginning script:

Hello, welcome to the interview. I am Cindy Edwards, the principal investigator of this study. It's a pleasure to meet you. As a reminder the purpose of the study is to explore the experiences of teacher educators who use technology for teaching and learning. This interview will last approximately 1 hour and will be audio-recorded. The audio recording will be transcribed. If upon analysis of the data I determine a second interview is necessary, I will contact you. Personally identifiable information is requested for research purposes and if needed for the follow-up interview. Numbers will be used to identify individual subjects, which will be utilized in the analysis of the data and for direct quotes, ensuring confidentiality. Myself, and the project advisor, Dr. Patrick Pauken, will be the only two who can access the research data. Participating is completely voluntary and you may discontinue your participation at any time. The risk of participating in this study is no greater than that in daily life. Deciding to participate or not will not impact any relationship you may have with Bowling Green State University. The data from the interviews will be kept on the BGSU OneDrive with analysis completed in Microsoft Office Word and Excel, of which I will have sole access. Scheduling the interview indicated consent to participate in the Experiences of Teacher Educators Utilizing Technology Within a Teacher Preparation Program research study. Thank you for participating today. I look forward to our conversation.

Introductory questions

How did you become a teacher educator?

Why are you interested in participating in this study?

What level of overall technology skills (educational and non-educational) do you consider yourself?

Topic-related questions

- How do you approach a tech issue that occurs during class (online or in-person)?
    - Can you provide an example of a time this occurred [tech issue in class]?
    - To what extent do you allow students to be a part of the troubleshooting process?
- How do you approach a tech issue that occurs when you are working in your office or at home?
    - Can you provide an example?
- How do you approach selecting technology for use in your classroom or course?
    - Tell me about the standards that you use to align technology with your content area
    - In what ways do you believe technology can enhance to your content area?
    - What technology specifically related to your content area do you currently use?
        - What have you used in the past?
- What pedagogical strategies or methods do you use when selecting content-specific technology for teaching and learning?
    - Can you provide an example?
- What are your best examples of evaluating technologies so that they align with content and the appropriate pedagogy?
    - How do you demonstrate and/or model this process with students?
- What are your current professional learning goals?
    - How do you intend to reach those goals?

    - Why did you choose these specific areas?
- What professional development do you plan to participate in during the next year?
- What type of support do you receive from your department, college, and the university?
    - Atmosphere of collaboration
    - If needed, how could this support be improved?
- Tell me about your experiences teaching online during the past year.
    - How much preparation did you need to convert to an online format?
    - What new digital tools do you use now that you did not use one year ago?

Researcher ending script:

[Participant's name], thank you for allowing me to interview you today as part of the Experiences of Teacher Educators Utilizing Technology Within a Teacher Preparation Program research study. As a reminder, personally identifiable information is requested for research purposes and if needed for the follow-up interview. Numbers will be used to identify individual subjects, which will be utilized in the analysis of the data and for direct quotes, ensuring confidentiality. Myself, and the project advisor, Dr. Patrick Pauken, will be the only two who can access the research data. The data from the interviews will be kept on the BGSU OneDrive with analysis completed in Microsoft Office Word and Excel, of which I will have sole access. Once the audio recording is transcribed, I will send it to you for verification. If a second interview is needed following data analysis of the first interview, I will contact you.

If you have any questions concerning this study, you may contact Cynthia Edwards at cjedwar@bgsu.edu. Further questions may be directed to the project advisor, Dr. Patrick Pauken at paukenp@bgsu.edu. For questions regarding participant rights, contact the BGSU IRB

(Bowling Green State University Institutional Review Board) at 419-372-2294 or 7716 irb@bgsu.edu.

Interview process:

- Seek out participants
- Select participants
- Schedule participants
    - Scheduling of the interview is the consent
- Conduct and record interviews
    - Goal – 10 teacher educators
- Review and edit (for accuracy) Zoom transcripts
    - Send to interviewee for verification
- Analyze data
- Request second interviews as needed

APPENDIX F. PARTICIPANT RESOURCES

Resource	Type	Description
Adobe Spark	app	video creation
Adobe Suite	cloud app	multiple apps for media creation
Apple pencil	hardware	tool for touch screens in Apple products
Backchannel Chat	website/app	real time class discussion tool
BlackBoard	LMS	learning management system
Bookshare	website	Bookshare is an online library of accessible eBooks for people with print disabilities, such as visual impairment, severe dyslexia, and cerebral palsy.
Bubbl	website	mind mapping
Canva	website/app	presentation tool
Canvas	LMS	learning management system
Canvas Studio feature	LMS add on	video discussion feature
Chromebooks	hardware	similar to a laptop designed to work solely in the cloud
Coggle	website	collaborative mind maps and flow charts
Common Sense Media	website	tools and resources for educators and families
Culturally and Linguistically Responsive Teaching and Learning	textbook	Sharroky Hollie
Desmos.com	website/app	math resources
Division of Elementary & Secondary Education: Arkansas	website	informational site for teachers in the State of Arkansas
Document Camera	hardware	
Dragon Box	iPad app	assortment of math apps
Evernote	website/app	productivity application
Exploring the Use of the iPad for Literacy Learning	article	
Facebook	website/app	social media
Flipgrid	website/app	video discussion application free via Microsoft
Flocabulary	website	hip-hop vocabulary videos through various content areas
Floop	website/app	feedback teacher to student, peer to peer, or self-assessment
Google Classroom	website/app	learning suite
Google Docs	website/app	online word processing
Google Drawings	website/app	online drawing creator
Google Forms	website/app	online form creation
Google Jam Board	website/app	collaborative digital whiteboard
Google Sheets	website/app	online spreadsheets
Google Sites	website/app	user-friendly websites
Google Slides	website/app	online presentation creator

Resource	Type	Description
GoReact	website/app	video evaluation tool
HyperDocs	website	educator resource sharing
Hypothesis	website	open source web annotation tool
International Society of Technology in Education	standards	
iPads	hardware	tablet often used in education
Kahoot	website/app	cloud based interactive assessment tool
Kaltura	website	video cloud platform
Kanopy	website/app	video streaming site
Kansas State Department of Education Top Math Resources Websites	website	list of vetted math websites
Khan Academy	website	
Loom	website/app	video messaging tool
Math Doodles	iPad app	math resources
Microsoft Office Suite, including OneDrive, Teams, SharePoint	software	word processing, spreadsheet, meetings, storage, etc.
Moodle	LMS	open source learning management system
NearPod	LMS	interactive lessons, videos, and presentations
Newsela	website/app	interactive lessons through multiple content areas
Panopto	website/app	video creation and management system
polleverywhere	website/app	interactive polling app
Quiziz	website/app	free interactive quizzes and lessons, similar to Kahoot
Read Aloud	Google add-on	text to speech voice reader
remind	website/app	group text/email - reminders, announcements
Schoology	LMS	utilize for teacher candidates who would be using it in the field
Screencastify	Google add-on	user friendly video creation
Screencastomatic	website/app	video creation and editing
SeeSaw	LMS	promotes student's engagement
Smart Classroom Professional Development Framework	framework	developed in Australia
Sphero	steam tools	steam based education tools
stick pick app	iPad app	random selection tool with option for data collection
Sumaze	iPad app	British designed math apps
The Distance Learning Playbook	book	Corwin Publishers; utilized in professional learning by participant and highly recommended
The Fred Rogers Center	website	Focused on children's growth through meaningful connections
The Math Learning Center (Developer)	iPad apps	series of math apps - especially manipulatives
The Triple E Framework: Learning First, Technology Second	article	
Triple E Framework by Liz Kolb	website	
Twitter	website/app	social media

Resource	Type	Description
University of Florida Literacy Institute	website	webinars to teach literacy online
VideoAnt	app	Video annotation tool
VidGrid	app	video recording and hosting
VoiceThread	app	interactive video conferencing
WeVideo	website/app	online video editor
Zearn math	app	free math online learning platform
Zoom	app	video conferencing tool