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Preparing Tomorrow's Teachers Using the Teacher Educator Technology Competencies (TETCs)

Abstract

This article examines the preparation of tomorrow's teachers by analyzing higher education teacher educators' attitudes towards the Teacher Educator Technology Competencies (TETCs). The study was based on the national education requirements that have been established by the U.S. Department of Education's Office of Educational Technology, International Society for Technology in Education (ISTE) and the Council for Accreditation of Educator Preparation (CAEP). The study focused on the current assumption that all teacher candidates will leave teacher preparation programs ready and able to use technology effectively in PK-12 classrooms. The researcher administered an online survey to a sample of teacher educators in order to identify their attitudes towards the TETCs. The main questions in this study included: (1) What are the attitudes of teacher educators towards the TETCs?, and (2) What are the professional development needs for teacher educators? The researcher offers various suggestions for future professional development options for teacher educators and teacher preparation programs. Some of these options include developing and administering educational technology workshops, moving away from stand-alone educational technology courses, and integrating technology into all teacher preparation courses.

Keywords

International Society for Technology in Education (ISTE), National Education Technology Plan (NETP), teacher candidates, teacher educators, Teacher Educator Technology Competencies (TETCs), Technological Pedagogical and Content Knowledge (TPACK)

Preparing Tomorrow's Teachers: Using the Teacher Educator Technology Competencies (TETC

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Introduction

As former U.S. Secretary of Education John King stated, "One of the most important aspects of technology in education is its ability to level the field of opportunity for students" (U.S. Department of Education, Office of Educational Technology, 2017, p. 3). In today's ever-changing technological world, all students can benefit from having technology seamlessly integrated into the current PK-12 curriculum. As the National Education Technology Plan states, "When carefully designed and thoughtfully applied, technology can accelerate, amplify, and expand the impact of effective teaching practices. However, to be transformative, educators need to have the knowledge and skills to take full advantage of technology-rich learning environments (U.S. Department of Education, Office of Educational Technology, p. 5)

Currently, there is a national initiative to reevaluate teacher preparation programs and the training of teacher candidates to use technology when they enter the world of PK-12 teaching. More specifically, how are higher education teacher educators (professors, instructors) preparing future educators (pre-service PK-12 education students, student teachers, teacher candidates) for teaching in today's technologically driven world? This paper examines teacher educators' attitudes towards technology integration in classrooms and how they connect to the Teacher Educator Technology Competencies (TETCs).

Background of Problem

In 2017, the U.S. Department of Education's Office of Educational Technology (OET) presented its updated version of the National Education Technology Plan (NETP), which identified a need to "develop a common set of technology competency expectations for higher education institution instructors and candidates exiting teacher preparation programs for teaching in technologically enabled schools and postsecondary education institutions" (U.S. Department of Education, Office of Educational Technology, 2017, p. 44). The NETP "sets a national vision and plan for learning enabled by technology through building on the work of leading education researchers; district, school, and higher education leaders; classroom teachers; developers; entrepreneurs; and nonprofit organizations" (p. 3).

The U.S. Department of Education's OET (2016) developed four guiding principles for the use of technology in all pre-service teacher preparation programs. These teacher preparation programs should "focus on the active use of technology to enable learning and teaching through creation, production, and problem-solving" (U.S. Department of Education, Office of Educational Technology, p. 9). Moreover, they 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" (U.S. Department of Education, Office of Educational Technology, p. 9). Plus, all programs should "ensure pre-service teachers' experiences with educational technology are program-deep and program-wide, rather than one-off courses separate from their methods courses" (U.S. Department of Education, Office of Educational Technology, p. 9). Finally, the programs should "align efforts with research-based standards, frameworks, and credentials recognized across the field" (U.S. Department of Education, Office of Educational Technology, p. 9).

For many years, the International Society of Technology in Education (ISTE) has been a driving force in creating and promoting educational technology standards at all levels of schooling (International Society for Technology in Education, 2019b). ISTE claims that all educators should be empowered "to harness technology to accelerate innovation in teaching and learning and inspire learners to reach their greatest potential. ISTE inspires educators worldwide to use technology to innovate teaching and learning, accelerate good practice and solve tough problems in education by providing community, knowledge and the ISTE Standards, a framework for rethinking education and empowering learners" (International Society for Technology in Education, 2019a, para. 9-10).

In fact, ISTE has played a key role in the development of technology standards and competencies being used in today's educational world. Foulger, Graziano, Schmidt-Crawford, & Slykhuis (2017) explained, "The National Educational Technology Standards for Students (NETS•S) were created by ISTE and first released in 1998. Then in 2000, ISTE released the National Educational Technology Standards for Teachers (NETS•T) as a way to help teachers support the NETS•S in classrooms" (p. 422). Since this time, ISTE has continued to influence and inspire the way teacher educators view the standardization of technology by requiring that all ISTE standards periodically go through a reevaluation process.

The current ISTE standards provide guidelines for the technology skills, knowledge, and approaches needed by all educators (International Society for Technology in Education, 2019b). Currently, ISTE claims standards for students, educators, education leaders, coaches, computer science (CS) educators, as well as specific computational thinking (CT) competencies for educators. These recognized standards are being used by teachers to develop lessons, plan curriculum, and decide on appropriate professional development opportunities. As an example, the current ISTE for Educators standards focus on the following categories (a) learner; (b) leader; (c) citizen; (d), collaborator; (e) designer; (f) facilitator; and (g) analyst (International Society of Teacher Educators, 2019c). Although there are many useful technology standards offered by ISTE, this society does not have specific standards focused on teacher educators.

Furthermore, the Council for Accreditation of Educator Preparation (CAEP)'s vision is to advance equity and excellence in educator preparation through evidence-based accreditation that

assures quality and supports continuous improvement to strengthen P-12 student learning (Council for Accreditation of Educator Preparation, 2018b). The CAEP standards are used during reviews of teacher preparation programs and are based on two principles (Council for Accreditation of Educator Preparation, 2018a). First, an institution must provide evidence that its graduates are competent and caring educators. Furthermore, there must be evidence that the program's teacher educator faculty and staff possess the capacity to create a culture of evidence and use it to maintain and enhance the quality of the professional programs they offer. CAEP Standard 1.5 stresses that all teacher preparation programs must "ensure that candidates model and apply technology standards as they design, implement and assess learning experiences to engage students and improve learning; and enrich professional practice" (Council for Accreditation of Educator Preparation, 2013, p. 1).

Yet, who is instructing teacher candidates on how to use technology? Who is presenting the current ISTE and CAEP standards to the candidates? Who is training them on how to effectively integrate technology in the classroom? Foulger, Graziano, Schmidt-Crawford, & Slykhuis (2017) state, "All teacher candidates should have equitable, high-quality technology experiences throughout their teacher preparation programs" (p. 436). There should be no uncertainty of whether a teacher candidate entering a college classroom or lecture hall will encounter an instructor fully capable of taking advantage of technology to enhance learning. Accrediting institutions, advocacy organizations, state policymakers, administrators, and educators have to collaborate on a set of clear and common expectations and credentialing regarding teacher educators' abilities to design and implement technology-enabled learning environments effectively (Foulger, Graziano, Slykhuis, Schmidt-Crawford, & Trust, 2016).

However, are the current teacher educators truly prepared to teach the students of today and those of tomorrow? Borthwick and Hansen (2017) asked "Should we have a similar yet separate set of standards for teacher educators? Is there a unique set of competencies that are different from standards for preservice or inservice teachers?" (p. 46). This question is especially relevant given the current push in the United States to use technology in all PK-12 classrooms. "Colleges and schools of education today are facing a challenge caused by the differing philosophies and views of their teacher education faculty and the educational technology faculty. Some believe that technology should play a role in education and should be integrated within teacher education courses. Others feel technology should be left to an expert who teaches one course on technology skills. Still others believe that there are more important skills preservice teachers need, such as literacy or child development, and that technology is receiving too much attention" (Sprague, 2018, para. 1). Many of these teacher educators may have not used a more advanced technology than a blackboard or overhead projector in their own teaching and learning, so they may not see technology integration as a necessary skill for today's teacher candidates. Yet, "teacher educators cannot and should not ignore their responsibility and commitment to the ever-changing nature of technology and its role in society and PK-12 schools" (Foulger, et al., 2016, p. 251).

The Teacher Educator Technology Competencies (TETCs) are a newly developed set of competencies that were developed by a group of educational technology experts who offered their opinions as to what they believe to be the skills, knowledge, and attitudes teacher educators who support teacher candidates need to possess (Graziano, Foulger, Schmidt-Crawford, & Slykhuis, 2017; Foulger et al., 2016; Foulger, et al., 2017; Society for Information Technology

and Teacher Education, 2018). Research indicates that many current teacher preparation programs need to be restructured to ensure that teacher educators are effectively using technology in their courses while training teacher candidates for employment in future PK-12 classrooms. The TETCs are a positive step in that direction. Establishing a set of competencies for teacher educators will allow faculty and college leaders to work towards a mutually agreed upon faculty development target (Borthwick & Hansen, 2017). Graziano, et al. (2017) claim that these competencies can be used as the basis for colleges of education to systematically address technology integration throughout a program, for faculty goal setting and professional development, and as a basis for credentialing decisions. The official endorsement of the same set of competencies by multiple professional educational associations should increase the importance and value of adopting technology competencies for teacher educators.

The NETP stressed that higher education institutions are responsible for providing professional development to teacher educators and ensuring that all educators are capable of selecting, evaluating, and using appropriate technologies and resources to create experiences that advance student engagement and learning (U.S. Department of Education, Office of Educational Technology, 2017). This goal cannot be achieved without infusing technology-based learning into teacher education programs (Foulger, et al., 2017). “Some teacher educators do not understand the type of teaching and learning technology supports. They have developed a culture that does not include technology and are uncomfortable when that culture is challenged” (Sprague, 2018, para. 2). Therefore, for many teacher preparation institutions, this change in philosophy to technology-enabled preparation will entail the restructuring of instructional approaches and techniques. It will also require additional professional development for teacher educators to acquire updated technology skills and be equipped to use newer technology tools. The NETP (U.S. Department of Education, Office of Educational Technology, 2017) asserted that this rethinking should be based on the understanding of the roles and practices of educators in environments in which learning is supported by technology.

Many current teacher educators do not have the necessary skills and knowledge to integrate technology into courses (Sprague, 2018). It is inaccurate to assume that because pre-service teachers are tech savvy in their personal lives, they will understand how to use technology effectively to support learning without specific training and practice. Additionally, technology expertise does not develop after the completion of a single educational technology course separate from other teaching methods courses, but rather through the inclusion of authentic educational technology experiences in all courses modeled by the faculty in teacher preparation programs (U.S. Department of Education, Office of Educational Technology, 2018). Current technology was not a part of the majority of current faculty members’ teacher education preparation. Therefore, the technology skills that they have developed were most likely self-taught, learned at professional development workshops, or learned from a technology-proficient mentor. Moreover, many of these teacher educators may not be aware of the updated ISTE and CAEP technology standards,

Also, there is a concern that teacher education faculty members do not know enough about technology integration to model its use in PK-12 classrooms (Sprague, 2018). “Teachers are change agents in schools. They are key drivers who play crucial roles in technology integration in the schools and classrooms. It is important for them to possess positive computer attitudes

since attitudes has been found to be linked to usage and intention to use, variables that determine successful technology integration in education" (Nishta, 2012, p. 199). In essence, some faculty members may be technology-literate, but their understanding of how to integrate technology effectively in the PK-12 classroom is limited. Sprague explains that not many graduate and doctoral education programs model K-12 technology integration in their courses. Hence, many education professors are often unfamiliar with newer educational software and websites. Conversely, specifically trained educational technology specialists may be well-versed in the technology used in a classroom but may be less knowledgeable about the critical pedagogical issues of each content area. These teacher educators tend to focus more on the technology than on the content to be addressed. There needs to be a middle ground.

The TETCs initiative started as an attempt to reform how teacher candidates are prepared to integrate technology (Foulger, et al., 2017; Society for Information Technology and Teacher Education, 2018). "Trying to prepare a pre-service teacher to learn all that is needed in the area of technology and technology integration to enter a classroom is a difficult task. However, making a teacher feel confident in his/her abilities in the area of technology is even more difficult. Technology changes rapidly. Individuals need to feel comfortable and competent in his/her environment in order to be successful" (Ritter, 2015, p. 2). Ropp (1999) explained that many teachers possess positive attitudes toward technology, but that they do not consider themselves qualified to teach using it. The TETCs were developed based on the vision that all teacher education students can and should be proficient in teaching with technology, and all teacher preparation faculty should be prepared to address this need, no matter what course they teach.

This is a list of the current TETCs (Society for Information Technology and Teacher Education, 2018):

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.

Foulger, et al. (2017) state, "the TETCs encourage teacher educators to design instruction that utilizes content-specific technologies to enhance teaching and learning; incorporate pedagogical approaches that prepare teacher candidates to effectively use technology; and support the development of the knowledge, skills, and attitudes of teacher candidates as related to teaching how technology is used by learners in their content area" (p. 431). Also, the TETCs promote teacher educator participation in professional development to improve their technology use in their teaching.

The TETCs' developers felt that the competencies should not be viewed as a solution-oriented approach to technology integration for teacher preparation. It is not simply a one-size-fits-all method of adding technology to one's teaching. Instead, the competencies are "merely a first step in a larger reform of technology integration within teacher preparation programs. The end goal of the TETCs is to positively impact teacher candidates graduating from teacher preparation programs and teacher educators who teach within those programs, and to initiate conversations across institutions about larger reform issues surrounding the movement towards technology integration across the curriculum" (Foulger, et al., 2017, p. 436).

Method

This study assessed teacher educators' attitudes towards technology integration in classrooms and how they connect to the Teacher Educator Technology Competencies (TETCs). The study was designed using a quantitative survey research design using a convenience sample (Creswell, & Plano Clark, 2010; Gall, Borg, & Gall, 1996)). The researcher identified a population (N) of PK-12 teacher educators at higher education institutions in the United States of America. The sample (n) for this study included current PK-12 teacher educators at a private, higher education institution in the northern United States of America that educates future teacher candidates. Teacher educators can be defined as professionals who instruct and oversee education courses. Teacher candidates can be defined as current students who are in the process of becoming certified to teach in a PK-12 environment. The sampled institution offers various education programs that allow teacher candidates to learn the skills necessary to teach in a PK-12 classroom. The education programs are designed to train PK-12 teacher candidates who would like to enter the teaching profession.

The sample represented a "small proportion of a population selected for observation and analysis" (Best & Kahn, 1993, p. 13). "The population is any group of individuals that have one or more characteristics in common that are of interest to the researcher" (Best & Kahn, p. 13). The researcher chose a convenience sample of teacher educators; subjects were selected because they were easily accessible to the researcher. Gall, Borg, and Gall has noted that a generalization to a population can seldom be made with a convenience sampling procedure. However, the researcher decided on this sample to complete this project and prove its importance in the educational world. Gall, Borg, and Gall claimed, "Although a sample randomly drawn from a population is more desirable, it usually is better to do a study with a convenience sample than to do no study at all– assuming, of course, that the sample suits the purpose of the study" (p. 228).

The main questions in this study included: (1) What are the attitudes of teacher educators towards the TETCs?, and (2) What are the professional development needs for teacher educators?

Procedure

Participants

Once the researcher received approval from the Dean of the School and the Institutional Review Board, the sample was identified by obtaining a list of the names and email addresses of all current teacher educators at the institution. The 59 potential participants were invited via an email request and were informed of the study. Once consent was received by the researcher, the participants were contacted to complete an online survey. The survey ran for several weeks; participants were regularly reminded via email to complete the survey.

Instruments

The researcher used two main instruments in this study: 1) an implied consent form that identified who gave consent to be involved in the study, and 2) an online survey that measured attitudes (Creswell, & Plano Clark, 2010). These forms were designed by the researcher to meet the needs of the current study.

The implied consent form invited the participants to participate in the research study. Best and Kahn (1993) explained, "Recruitment of volunteers for an experiment should always involve the subjects complete understanding of the procedures employed, the risks involved, and the demands that may be made upon participants. Whenever possible, subjects should also be informed of the purpose of the research" (p. 45). The form used in this study explained that the individual was selected as a possible participant in this study because he or she was a current or former teacher educator at the institution. Additionally, the form explained that the project aimed to assess teacher educators' attitudes towards technology integration in classrooms. The consent form explained that if the individual decided to participate, he or she would be asked in a future email to complete an online survey. Moreover, it was explained that no benefits would be given to the teacher educators for answering the survey. It was promised that confidentiality would be maintained to the degree permitted by the technology used. The form explained that if the teacher educator decided to stop participating, he or she would be free to stop at any time.

The online survey was created using Google Forms and administered to all study participants. The researcher designed a tool that anonymously measured the teacher educators' attitudes towards the TETCs as well as their attitudes towards using technology in their teaching. Participation in this study was voluntary. The instrument required the participants to answer opinion questions about technology issues. Participants were informed that the results of the survey were anonymous and confidential. The survey contained twelve Likert scale questions that measured the TETCs. In addition, there was one multiple choice question inquiring about possible future technology workshops. Finally, there was an open-ended question that gaged interest in additional professional development opportunities, asking teacher educators to describe what forms of training they may be interested in attending in a future session.

Results of Study

The researcher used a quantitative methods approach in this study. “Quantitative descriptive research uses quantitative methods to describe what is, describing, recording, analyzing, and interpreting conditions that exist. It involves some type of comparison or contrast and attempts to discover relationships between existing non-manipulated variables. Some form of statistical analysis is used to describe the results of the study” (Best and Kahn, 1993, p. 26). The researcher contacted 59 teacher educators using email to obtain consent for the study. Twenty-three implied consent forms were completed and submitted, with eighteen teacher educators completing the online survey.

The majority of the participants reported that they currently use technology when teaching future educators. Eighty-nine percent of the participants felt that they support the development of the knowledge, skills, and attitudes of teacher candidates as related to teaching with technology in their content area. Seventy-eight percent of the participants agreed that they design instruction that utilizes content-specific technologies to enhance teaching and learning. Eighty-three percent of the teacher educators also claimed to use online tools to enhance teaching and learning. Seventy-eight percent of the respondents claimed that they apply basic troubleshooting skills to resolve technology issues. Furthermore, seventy-eight percent of the sample agreed that they incorporated various pedagogical approaches that prepare teacher candidates to effectively use technology.

The teacher educators reported their views of using technology in the assessment process as well as when they differentiate instruction. Seventy-eight percent of the respondents claimed that they used appropriate technology tools for assessment. A majority of the respondents agreed to using technology to differentiate instruction to meet diverse learning needs. Twenty-eight percent of the teacher educators strongly agreed or agreed that they used technology to connect globally with a variety of regions and cultures. Conversely, thirty-nine percent disagreed with this while thirty-three percent were unsure.

Overall, the teacher educators indicated that they desired various professional development technology workshops. Fifty percent of the participants showed a strong interest in learning more about using Google applications. Forty-four percent expressed interest in exploring Microsoft applications, and thirty-nine percent were interested in learning how to use an interactive whiteboard. Some respondents asked for help with plagiarism issues, technical help, and technology troubleshooting issues.

Discussion

Using the collected survey data, the researcher discovered that the teacher educators' attitudes towards technology integration in classrooms and the TETCs could be directly connected to distinct professional development needs. Although the participants claimed to use technology in some areas, the researcher discovered that they may require additional guidance in other areas,

such as direct technical instruction and infusing technology into their teaching. In order to meet these needs, the researcher suggests providing the requested assistance to teacher educators by designing and providing professional development opportunities such as technology and pedagogy workshops. Additionally, the researcher recommends that all teacher educators need to continue exploring technology usage in higher education and PK-12 classrooms.

The researcher found that teachers educators' attitudes towards the TETCs were mainly positive but felt that some of the current methods and pedagogies used in teacher preparation programs will need to be modified. Above all, all teacher educators will need to be proactive in infusing technology into all areas of working with teacher candidates. For example, the teacher preparation program at Saint Leo University was reviewed and modified after an alumni study revealed dissatisfaction with its teacher preparation in the area of technology in the classroom (U.S. Department of Education, Office of Educational Technology, 2017). Hence, the education department developed a specific technology goal and redesigned their program on the basis of the Technological Pedagogical and Content Knowledge (TPACK) model, in which pre-service teachers learned to blend content, pedagogical, and technological knowledge in their PK–12 instruction. The TPACK models attempts to combine the relationship between pedagogy, content, and technology (Koehler, & Mishra, 2009; Mishra & Koehler, 2006). Koehler and Mishra suggest, "At the heart of good teaching with technology are three core components: content, pedagogy, and technology, plus the relationships among and between them" (p. 62.) At Saint Leo, the faculty redesigned all of their teacher preparation courses to model the use of technology actively. The institution built an education technology lab where teacher candidates were able to practice using technology devices, applications, and other digital learning resources. Moreover, Saint Leo University also provided all teacher candidates with a "digital backpack" that contains a tablet, portable projector, speakers, and a portable interactive whiteboard. The researcher suggests this exemplar when working with other institutions in order to continue to promote the TETCs with teacher educators and teacher candidates.

By analyzing the quantitative data, the researcher discovered that many of the teacher educators in this study needed more direction using technology to connect globally with a variety of regions and cultures. The researcher recommends designing and providing professional development activities and workshops devoted to this timely and important topic. The Society for Information Technology and Teacher Education (2018) advocates modeling global engagement by employing various technologies to connect teacher candidates with other cultures and locations. As was stressed in the NETP (2017), "Educators can collaborate far beyond the walls of their schools. Through technology, educators are no longer restricted to collaborating only with other educators in their schools. They now can connect with other educators and experts across their communities or around the world to expand their perspectives and create opportunities for student learning. They can connect with community organizations specializing in real-world concerns to design learning experiences that allow students to explore local needs and priorities. All of these elements make classroom learning more relevant and authentic. In addition, by using tools such as videoconferencing, online chats, and social media sites, educators, from large urban to small rural districts, can connect and collaborate with experts and peers from around the world to form online professional learning communities" (U.S. Department of Education, Office of Educational Technology, p. 29). Moreover, teacher educators could benefit from trainings that teach them how to design instruction in which teacher

candidates employ technology to collaborate with learners from other backgrounds and cultures. Finally, teacher educators can present strategies needed for cultures and regions that have different levels of technological connectivity. These professional development activities would enhance the infusion of the TETCs into a teacher preparation program.

Furthermore, the researcher found that the majority of the respondents were able to apply basic troubleshooting skills to resolve technology issues. In order to continue this positive trend, the Society for Information Technology and Teacher Education (2018) offers certain skills that teacher educators should implement and teach their teacher candidates. These skills include configuring digital devices for teaching, operating digital devices during teaching, modeling basic troubleshooting skills during teaching, and finding solutions to technology problems using a variety of resources. By being able to execute and model these behaviors, the teacher educators will promote the TETCs with their teacher candidates.

Based on the data collected, the researcher draws a conclusion that current teacher preparation programs need to move away from stand-alone educational technology courses and move towards integrating technology across all teacher preparation courses (Sprague, 2018). Following the OET's first guiding principle, "teachers must be equipped with the skills to integrate technology seamlessly into their instruction in ways that move beyond mere presentation and communication to a place of creation, innovation, and problem-solving. With the increased investment in infrastructure and classroom technology by school districts nationwide, the use of technology in teaching can no longer be an afterthought in lesson and unit planning. Therefore, teacher preparation programs must ensure instruction focuses on the active use of technology. Today's teacher educators need to focus on a broader view of using technology in the classroom" (U.S. Department of Education, Office of Educational Technology, p. 10). The Society for Information Technology and Teacher Education (2018) suggests certain ways that teacher educators can infuse the TETCs into their current curricula. It is not necessary for teacher educators to change everything about the way they teach; instead, they can tweak certain areas of instruction to include more technology infusion. During their teaching, teacher educators can model the use of technology for accessing, analyzing, creating, and evaluating information. They can also help teacher candidates with evaluating, selecting, and using appropriate technology to support student learning. Moreover, teacher educators can design and facilitate classroom opportunities for teacher candidates to practice hands-on teaching with technology.

Limitations of the Study

There were various limitations to this study about teacher educator technology competencies. Limitations can be defined as the conditions beyond the control of the researcher that place restrictions on the conclusions of the study (Best & Kahn, 1993). In this study, the limitations included an unknown population sample size (N), therefore leading to a limited sample size (n), lack of demographics in the data-gathering instrument, and technological issues during communication to prospective participants.

Population & sample size limitations. This study was conducted with a limited number of PK-12 teacher educators (Creswell, & Plano Clark, 2010). There is available data on the general population of PK-12 teachers and higher education professors in teacher preparation programs.

However, data on the exact number of PK-12 teacher educators was not available to the researcher. Hence, a convenience sample set (n) of 59 possible study subjects (PK-12 teacher educators) from the higher education institution were identified. The researcher contacted these individuals via email to complete the implied consent form. Twenty-three teacher educators completed the form and consented to being part of the study. Eighteen of these teacher educators completed the online survey. Hence, the final sample size (n) was limited to eighteen participants.

Data-gathering instrument and demographics limitations. The online survey that was used in this study was not tested for reliability or validity. It was designed by the researcher to meet the needs of the new TETCs construct. Since the TETCs construct was a new one, the researcher was unable to find a previously tested instrument. In future studies, a reliability and validity-tested tool will be explored. Additionally, the survey did not include a section on demographics. This was an issue when the researcher analyzed the data. In future studies, the researcher will include demographics questions, such as age, gender, ethnicity, education level, and years of educational experience.

Technological limitations. This study was conducted exclusively using electronic mail correspondence and online survey methods. Hence, the study was limited to teacher educators who regularly used electronic mail and online tools. Another limitation was the researcher's ability to know if all of the targeted teacher educators were reached. If an email was misdirected, the individual may not have been able to respond. The online format of the survey may have excluded individuals who are not technologically savvy. If a prospective teacher educator participant was not technologically-savvy, he or she may not have been able to complete the online survey or even use email to obtain the invitation. This would mean that his or her voice was not heard in this study.

Future Directions

Based on the findings of this study, the researcher feels that there needs to be more research conducted in the field of teacher educator technology use and instruction. Specifically, the researcher suggests that more studies be conducted in the field of distance learning and teaching with pre-service PK-12 educators and teacher educators. This study examined the traditional, face-to-face driven TETCs, but will teacher candidates be ready to teach using all modalities (face-to-face, blended, online)? The OET suggests, "Provision of both faculty and pre-service teachers with regular exposure to and experience with teaching and learning technologies and strategies relevant to online, blended and face-to-face environments and their affordances and constraints" (U.S. Department of Education, 2016, p. 18). Hence, more study needs to be devoted to examining how teacher educators use online and blended learning environments when working with teacher candidates.

This study was conducted with a limited number of teacher educators (Creswell, & Plano Clark, 2010). A sample (n) of 59 possible study subjects (teacher educators) were identified from a possible population (unknown N) of teacher educators . The researcher contacted these individuals via email to complete the implied consent form. Twenty-three teacher educators completed the form and consented to being part of the study. Eighteen of these teacher educators

completed the online survey. Hence, the final sample size was limited to eighteen participants. It is suggested that a larger population and sample are explored for a future study since the convenience sample was unable to yield a true generalizable result.

Another future direction for the researcher is to explore a stronger instrument to measure the TETCs. As was stated in the methodology section, this Likert-scale tool was not previously tested for validity and reliability. Simply, the researcher was unable to find a previously tested TETCs-related instrument. Going forward, the researcher plans to find a new tool or have this existing tool put through extensive reliability and validity field testing with other populations.

Additionally, the researcher strongly suggests that this study be extended to include other higher education institutions in different geographical locations with different groups of teacher educators. It could also be extended to include current and former PK-12 teacher candidates and their attitudes towards the TETCs. Do they feel that current teacher educators are meeting (or met) the technology standards? Were they prepared to use technology in the PK-12 classroom? Were they made aware of the ISTE or CAEP standards during their education? Why or why not? Moreover, do they have any suggestions as to what was missing in their teacher preparation programs? This study would help to further develop the TETCs and pave the way for other technological advances in this field.

Conclusion

As technology advances, the need for highly qualified teachers will continue, and it will be assumed that all teachers will be able to use technology effectively. The NETP (2017) claims that schools should be able to depend on teacher preparation programs to ensure that all teachers come to them prepared to use technology (U.S. Department of Education, Office of Educational Technology, 2017). Other educational accrediting bodies such as CAEP also stress the importance of having all teacher candidates prepared to use technology for the classroom. By promoting the TETCs, higher education institutions can move towards meeting all national standards for preparing teacher candidates. Above all, teacher candidates will "need to leave their teacher preparation programs with a solid understanding of how to use technology to support learning" (p. 35) upon their entry into the world of teaching. These future educators should have received appropriate and updated educational experiences in order to be prepared to teach in today's PK-12 classrooms. The Society for Information Technology and Teacher Education (2018) asserts that 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. Therefore, all current teacher educators must be prepared to model and integrate these forms of technology in their teaching. Hopefully, by using the TETCs as motivational starting points, teacher educators can assist teacher candidates to use technology competently and confidently in the classroom.

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