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Preservice Teachers Learning to Teach Online: Developing Teacher Leaders

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Abstract

Technology is woven throughout our daily lives now more than ever. Therefore, teacher education programs need to meet this digital demand and begin to prepare teacher candidates for their future in teaching with technology. Even before COVID-19, K-12 education included virtual schools, therefore, the necessity of preparing teacher candidates for the successful implementation of online instruction are of utmost importance. To meet the needs of their future students, candidates must be prepared to integrate technology into their teaching as well as be prepared to teach online. To prepare 21st century learners, teacher candidates must create learning opportunities for their students to learn with and through technology. The Technological Pedagogical Content Knowledge (TPACK) structure was designed for teachers to understand the relationships between and among technology, pedagogy, and content. The purpose of this research was to revise traditional instruction where the professor models and implements technology tools to allow candidates the opportunity to develop their TPACK in their two years in a teacher education program. To develop the TPACK of teacher candidates, education preparation professionals worked together to design and implement the School of Education, Technology Integration Project. Through this innovative approach developed by a team of professors, the School of Education has changed its' coursework in all programs to include more online teaching, the inclusion of technology for teaching content, and the use of assistive technology. As a result, student teachers and graduates are reporting that they are now being recognized as teacher technology leaders and are showcasing technology lessons at their schools.

Keywords: educator preparation program, TPACK, technology education, online courses, online instruction, educational technology leadership

Literature Review

Why Prepare Teachers to Teach Online?

An increased use of online and virtual learning is becoming wide-spread and is enabling the delivery of educational opportunities beyond the boundaries of face-to-face instruction (Horn, Christensen, & Staker, 2014; Namukasa & Gadanidis, 2011**).** Online or virtual learning options have increased exponentially since the early 2000s (Gulosino & Miron, 2017). The National Center for Educational Statistics (2014, Table 218.20) reported an increase from 317,000 K-12 students in 2002 to 1,816,390 K-12 students in 2010 who were enrolled in online learning courses. Public schools are using three basic online models: supplemental online coursework, all coursework being conducted online, hybrid, or blended instruction (Gemin et al., 2017). It has become increasingly evident that today's educators must be able to combine the teaching of interpersonal relationships/communications with the expanding digital landscape present in their students' lives (International Literacy Association, 2018; Bergeson & Beschorner, 2021). To address this increased enrolment in online and blended courses in the K-12 schooling environment, teachers now need adequate preparation in online/blended pedagogy because online teaching calls for a different skill set than that of face-to-face classroom teaching (McAllister & Graham, 2016). The primary modes of preparing teachers in such practices are through preservice and professional development programs (McAllister & Graham, 2016). As our educational school systems continue to advance in technology, our teachers must be prepared and able to adapt (Starkey, 2020).

Given the paradigm shift prompted by teaching online, it is not surprising that teacher accreditation agencies have now instituted new mandates for educator preparation programs to equip teachers to teach online. Upon graduation, preservice teachers should be competent in teaching with technology and must stay current with their skillsets in the ever-changing digital landscape (Kaufman, 2015). For today's youth and our educators, technology plays a vital role (Birch & Lewis, 2020). All educators, those preparing teacher candidates, teacher candidates, and current K-12 teachers, must learn how to navigate the ever-changing landscape of information technology (Truesdell & Birch, 2013). When teachers have a strong foundation in technology, they have the ability to supplement the content being taught with media and other digital sources which makes for a more effective learning environment and an enhanced scholastic experience for all (Judge & O'Bannon 2008; Krumsvik, 2008; Voithofer et al., 2019).

It is becoming increasingly likely that new teachers who complete an educator preparation program will have online instruction in their curriculum (NEA, 2017) because the profession of teaching is changing rapidly with technology as its driving force (Thomas et al., 2013). With public schools infusing more online course options, teacher candidates need to be equipped to provide online instruction in a variety of learning environments and therefore, more educator preparation programs are committing to educating preservice teachers about online education (Luo et al., 2017). As online learning becomes more relevant in the future of education, the technological skillset required for teaching must adapt (Gille & Britton, 2020) and K-12 teachers must be prepared and able to adapt to this new way of teaching (Starkey, 2020).

Benefits of E-Learning for K-12 Schools

Experts are finding benefits to teaching and learning online. Researchers suggest that the wealth of availability of online resources lessens the need for printed materials. Innovations in problem solving can be displayed and shared through technology. Exemplary work and activities that are imperative for student success can also be shared through this mode. Online learning provides space for the use of videos, discussion forums, and it can be used as a hub for teachers to share ideas (Namukasa & Gadanidis, 2011).

Several states within the United States are opting to add more K-12 online courses to prepare students for college and career readiness and to add more course options to a larger pool of students (Archambault et al., 2016). Archambault et al. (2016) evaluated states' online accountability systems for both students and teachers. Their findings present the need for states to establish clear expectations and communication for instructors.

In addition to flexible timing, Watson and Gemin (2008) found online learning could assist migratory families or students who move often. Repetto et al. (2010) report that online education is particularly beneficial for students with disabilities and students at-risk for dropping out of school. They also suggest that teachers must prepare to teach students to use an online platform through educator preparation programs or professional development (Repetto et al., 2010).

Educators have had to transition away from in person teaching to an effective online learning experience that is filled with all facets of technology. The combination of digital and non-digital tool sets to enhance the teacher/student communication will allow for a more well-rounded

21st century student (Bergeson & Beschorner, 2021). Today's teachers and students are dependent on technology for "communication, information, and learning" (Ellis et al., 2021, p. 697).

E-Learning and PreService Teacher Impact

Shulman (1987) examined teacher education and determined effective teaching relies on pedagogical content knowledge. The evolution of this has changed to add teaching with technology. The term technological pedagogy content knowledge (TPACK), coined by Koehler and Mishra (2009), is a framework where technology, pedagogy, and content knowledge are used to create an approach for technology integration in classes.

Thomas et al. (2013) suggested that the most effective way to prepare teacher candidates in the use of education technology is for TPACK to be used and modelled in the teacher education curriculum. To ensure that preservice teachers are adept and confident using available technology, it is essential that TPACK be integrated fully into teacher preparatory programs. The involvement of leadership can facilitate this change and encourage teacher educators to fully embrace the TPACK framework.

In a review of literature, online teacher education preparation has been inconsistent and has not produced best practices. Clear direction and effective pedagogy are needed to prepare teachers for their increasing role as online educators. The technological pedagogical content knowledge (TPACK) framework has been recommended as the theoretical basis for which educator preparation programs begin the work of designing and implementing effective online teacher preparation (Moore-Adams, Jones, & Cohen, 2016). New teachers must have an awareness of technology limitations, i.e., computer equipment and internet access, that may play a part in their course delivery and design. Field experience in the actual school district will provide preservice teachers first-hand knowledge of any potential technological barriers they may face (Tondeur et al., 2016; Voithofer & Nelson, 2021).

Teacher Training Institutions (TTI) throughout the world are assessing teacher candidate curriculum and developing best practices for increasing knowledge of technology, pedagogy, and content: TPACK (Mouza et al., 2017; Sun et al., 2017). Six hundred and eighty-eight final year preservice teachers in Belgium were surveyed to examine the efficacy of strategies in place to prepare them for technological pedagogical content knowledge: TPACK. Preservice training is crucial to develop TPACK competency. Future teachers need model lessons, which integrate

subject content with pedagogy and technology. The survey revealed the importance of assisting preservice teachers with their own TPACK curriculum design, which they can test first-hand for effectiveness during field experiences (Tondeur et al., 2019).

A Response to the Pandemic

In March 2020, most schools and universities across the United States were shuttered. Thousands of teacher education candidates enrolled in field experiences and student teaching were affected as well as all K-12 teachers and students. Devising a plan to assist these up-and-coming teachers with field experience/student teaching was of utmost importance at the University of Nevada, USA as well as at other teacher preparation programs across the nation. Faculty and stakeholders provided leadership and support with the creation of virtual environments to connect with and reassure their candidates. This allowed for a means to continue to mentor and supervise the candidates. The candidates in turn were able to demonstrate their competency as teachers. Developing a plan to accommodate preservice teachers in their field experiences/student teaching and implementing best practices helped to smooth the unexpected and immediate transition to an online teaching experience. As a result, teacher education faculty at the University of Nevada established a process they called Consistency, Access, Supervision, and Evaluation (CASE). The writers of CASE detailed possible future online teaching and learning scenarios and dealt with different ways barriers can be addressed and opportunities realized. Before the worldwide pandemic, the field experience of being in a physical classroom laid the practical foundation and best understanding of the profession. The necessity of these online student teaching experiences has “made it possible for the teacher education program to be better prepared if school closures should arise in the future” (Quinn & Paretti, 2021, p. 100). Educators demonstrated the ability to drastically change their approach to teaching at a moment’s notice. Flexibility and ingenuity have spawn innovative practices and the lessons learned from the COVID-19 shutdown will continue in normal times (Quinn & Paretti, 2021). “What educators did to continue candidate and student learning during Spring 2020 is evidence that professional educators know what can and should happen when closures occur” (Quinn & Paretti, 2021, p. 100).

After Covid-19 moved the university’s instruction online, faculty at the University of West Georgia, USA adjusted the remaining assignments for those students who were engaged in field experiences to give them insight into how K-12 teachers were adjusting their own pedagogy to digital learning. Teacher candidates were asked to present samplings of their online teaching

experience via video to explain their approach to this pedagogical challenge. These videos assisted peers by sharing techniques others used in their online classrooms. The teacher candidates also created an online science learning activity that could be done remotely and interviewed their cooperating classroom teachers to better understand the obstacles faced when making the shift to online instruction. By redesigning the remaining assignments, preservice teachers gained a better understanding of how the pandemic was affecting schools and educators alike and how they must all adapt quickly. This practice of having preservice teachers design new implementations of online learning will fortify their ability to deliver knowledge to their students in the future. The quick actions of these teacher candidate educators ensured a meaningful and beneficial field experience. Many schools across the USA have already begun to offer eLearning days intermixed with normal in person school schedules as this will help with the transition should the need arise. Due to a growing demand for online learning, teachers must be able to switch between eLearning and in person teaching effortlessly as circumstances dictate (Gille & Britton, 2020).

Two professors in the teacher preparation program at the Dominican University of California, USA responded to community need by accepting an invitation from the local school system. At the start of the global pandemic, they were asked to teach technology training sessions for K-12 teachers to support the rapid move to remote learning (Birch & Lewis, 2020). The professional development classes were attended by K-12 teachers and staff of public and private schools in the area. Prior to the global pandemic, Professors Birch and Lewis had observed that "many preservice and in-service teachers did not feel comfortable and confident with technology" (Birch & Lewis, 2020, p. 151). This inspired them to develop instructional technology training that emphasized virtual learning methods during the 2019-2020 school year (Birch & Lewis, 2020).

The College of Education's teacher preparation program at New Mexico State University, USA quickly revised the technology integration course to adjust to necessary shifts cause by COVID-19 (Chattrjee & Parra, 2020). Integrating Technology with Teaching (ITT) is a course which provides preservice teachers the opportunity to utilize technology in course planning and development. Aware that a sudden change to the syllabus at mid semester along with the stresses and anxiety caused by the global pandemic could negatively influence student participation and success, the instructor used a student-centred approach to the course redesign. Addressing the unexpected shift to online learning and the shorter semester length, while keeping in mind the students' individual and collective needs, the course content was redesigned, and activities

streamlined. Zoom, Twitter, and more use of TPACK were instrumental in accomplishing positive learning outcomes. By integrating social media in the course, these future teachers experienced the impact and value of staying connected when socially isolated and could better "reflect on the issues such as distance barriers and affordances involving student learning and communication in a diverse community" (Chattrjee & Parra, 2020, p. 433). The ITT course is the only technology course in the teacher preparation program at New Mexico State University. The faculty teaching the course continue to evaluate and look for innovative ways to expose preservice teachers to the best tools and methods for integrating technology in the classroom (Chattrjee & Parra, 2020).

After widespread school closures caused by the COVID-19 pandemic, online learning became critical for school systems all over the world. Face to face teaching was replaced with online learning to protect students and teachers from the coronavirus. Results of a study by Velichová et al. (2020) offer insight on the perception of online learning by students and educators at selected secondary schools in Slovakia. The students in this age group are identified as Generation Y and are considered proficient and receptive to changing digital technologies in coursework. Improvement in digital skills and more independence and responsibility for tasks were positive results identified by teachers of their students' online learning experience. Having a solid technical structure already in place was important for success along with previous experience in the online platform. The teachers are at the centre of the educational experience whether online or face to face, and they "contribute with their professional, moral, and pedagogical-psychological qualities to the outcome of this process" (Velichová et al., 2020, p. 1639).

The global pandemic was thrust upon the world, and the world had to acclimate to a new normal Although many educator preparation programs worldwide were providing online instruction before COVID-19, they were not providing all the instruction online. The examples in this section are only a meagre sample of the educators who became technology leaders at their institutions.

The Role of Faculty Leadership in Implementing Technology into Preservice Teacher Curriculum

As faculty technology leaders emerged in university classrooms throughout the world, changes were made to Educator Preparation Programs. A prepandemic study by Instefjord and Munthe (2017) shed light on the challenges teacher educators face when preparing their preservice

teachers with the technological tools necessary for success in their future classrooms. Measuring the digital competency of preservice teaches covered several key areas: educating their students on how to use digital tools, being able to explain the ethical use of social media, promoting learning with the use of digital technology, being competent in the use of interactive whiteboards and other visual displays and being a role model for their students. The findings show the importance of a teacher's ability to integrate digital/technological skills into practice for a successful learning experience (Starkey, 2020).

As a result of a professional collaboration at the 2018 National Technology Leadership Summit (NTLS), education technology teacher educators from six different institutions across the United States surveyed teacher education faculty on their perspectives and experience with integrating technology into their teacher preparatory programs (Foulger, 2020). The goal was to gain a better understanding in how education faculty rank the importance of technology for learning, their confidence in providing instruction for technology use in PK-12 teaching, and support from leadership for immersing technology into the curriculum (Clausen et al., 2021).

It has become abundantly clear that after the rapid changes in the use of technology and online teaching that were made due to the pandemic, teaching will never be the same. Our society has shifted to include more technology than ever before. We, as technology leaders in the field of education, must prepare preservice teachers to, not just teach online but, thrive in an online environment and become teacher technology leaders at their schools.

Theoretical Framework

Koehler and Mishra (2006) developed the framework for this study: Technological Pedagogical Content Knowledge (TPACK). Technological Pedagogical Content Knowledge was developed for teachers to understand the interplay between and among technology, pedagogy, and content (Young et al., 2012). To establish the necessary TPACK with any content, preservice teachers need consistent training, relevant professional development, and hands-on experiences with the technology they will be using in their classrooms (Baran et al., 2016). Preservice teachers should be prepared to integrate student-centred technology to promote active learning (Maeng et al., 2013). To develop TPACK, preservice teachers must participate in trainings that allows them to collaborate with other preservice teachers and experts, apply technology in actual classrooms with students, and be provided with feedback on their progress (Jimoyiannis, 2010).

Mishra and Koehler (2006) identified seven components of TPACK—Technological Knowledge (TK), Content Knowledge (CK), Pedagogical Knowledge (PK), Technological Pedagogical Knowledge (TPK), Technological Content Knowledge (TCK), Pedagogical Content Knowledge (TPK), and Technological Pedagogical Content Knowledge (TPACK). The framework consists of components that interact with each other. Technological knowledge (TK) refers to being computer literate and understanding information technology enough to be able to apply it in everyday life (Koehler & Mishra, 2009). Technological knowledge includes knowledge of both software and hardware and how these resources work. Pedagogical knowledge (PK) is teachers' knowledge of the practices of teaching and learning and is essential so that teachers know how to teach students; they need to understand the strategies and methods that make learning accessible. Content knowledge (CK) is teachers' knowledge of the subject matter they teach and includes knowledge of concepts, theories, and ideas. Technological content knowledge (TCK) represents the interplay between technology and content and how they influence and constrain one another. When teachers possess TCK, they can integrate technology in a purposeful way that enhances the learning of a particular discipline. Technological pedagogical knowledge (TPK) is an understanding of how certain technologies can be used for teaching and learning purposes. Technological pedagogical content knowledge (TPACK) then, is the interweaving of all these components, and it is the understanding of how to integrate technology tools in a teaching and learning context to help others develop knowledge of a particular discipline (Koehler & Mishra, 2009). Preservice teachers' TPACK, can be defined as understanding how technology uncovers student misconceptions about a subject matter, transforms student thinking about the different methods and inquiries of the content, and plays a role in creating a positive classroom environment through effective classroom management (Baran et al., 2016).

Purpose

The purpose of this study was to evaluate the implementation of the School of Education Technology Integration Project that was designed to not only prepare candidates to teach online, but to increase their TPACK.

Participants

The candidates who were involved in this study were in their final semester of year-long student teaching. All candidates were in the Elementary Education Program in the School of Education at a large public college in northeast Georgia, USA. There were 78 participants of which 74 were female and 4 were male. They ranged in age from 21-50 with the majority between the ages of 22-25.

Methods

The School of Education at a large public college in northeast Georgia, USA designed a systematic plan to provide candidates with assignments that would increase their Technological Pedagogical Content Knowledge. In this multi-phase project, candidates designed, implemented, and assessed learning experiences in an online environment. In addition, candidates experienced the perspective of being an online learner by serving as a "student" in the online course sections of their peers. They also reviewed how to analyse data in a learning management system (LMS) and learned how to leverage technology to assess and maximize learning for all students. Each assignment was part of the School of Education Technology Integration Project and was tied to the International Society of Technology Education (ISTE) standards for educators and students (see Table 1). With author permission, this study used the survey that was developed in the article "Technological Pedagogical Content Knowledge (TPACK): The Development and Validation of an Assessment Instrument for Preservice Teachers" (Schmidt et al., 2009) to assess the candidates' TPACK. All participants were provided with an online version of this Likert Scale survey.

Table 1:

ISTE Standards by Semester

Semester	ISTE Student Standards	ISTE Educator Standards Technology Assignment
First	1d, 3b, 5b 2c, 4b, 3b, 6a, 7b	Technology D2L Assignment
Second	1d, 1a, 4d, 6b 2c, 3b 4b 4c 6a, 7b 5b	Technology Peer Evaluation Assignment
Third	7c	Technology Data Analysis Assignment

Beginning with their first semester in the teacher education program, candidates learned about curriculum and the Georgia State Standards; as part of this process, they had their first exposure to the use of technology in the instructional process and were starting to learn how to use technology in their teaching. They were exposed to a variety of technology tools for teaching and learning and had the unique opportunity to create an online lesson in an LMS Brightspace- D2L sandbox). Candidates were put in the driver's seat and were able to create an online lesson from standards to assessment. They were required to have at least three objectives each tied to a different assessment: quiz, assignment, and discussion board. Teacher candidates were also required to create a video of themselves teaching content to place in their D2L sandbox as well as use at least two other online technology tools for lesson introduction, review, or assessment.

In their second semester, candidates critiqued the online lessons of their peers. This assignment allowed candidates to not only explore a peer's online class as a "student", but also provide them the opportunity to receive constructive feedback on how they might enhance their own digital learning environment for their future students.

During their third semester, in the teacher education program, the School of Education Technology Integration Project allowed teacher candidates to review how to analyse data in a learning management system (Brightspace). Candidates also compared the data analysis features of Excel to that of a learning management system. They discussed the pros and cons of both data analysis platforms.

Also, in their third and fourth (student teaching) semesters of the program, candidates continued to plan and deliver instruction that included the appropriate use of technology. During these semesters, candidates are also collected data for the purpose of analysing the impact of their instruction on student learning. Candidates had to select or design assessments that were appropriate for the desired learning outcomes as well as collect data, analyse the results and draw conclusions regarding the degree to which their students met the learning outcomes (See Table 2).

All these course-embedded technology experiences in the School of Education Technology Integration Project allowed our teacher candidates to model and apply the International Society for Technology in Education (ISTE) standards for educators and students by using, evaluating, discussing, and building technology experiences through their Brightspace sandbox project as well as through data analysis, and implementing lessons in their student teaching semesters. Our candidates graduated knowing how to use a variety of technology tools to introduce, teach, review, and assess content. They know how to hook and engage students with technology as well as use technology to analyse data to inform instruction.

Table 2:
Evolution of technology project over time

Objectives	Semester 1	Semester 2	Semester 3	Semester 4
Explore curriculum and standards	X			
Create an online lesson in LMS	X			
Record video teaching content	X			
Critique peer course		X		
Receive constructive feedback		X		
Analyse data in an LMS setting			X	
Compare and contrast LMS data analysis to Excel data analysis			X	
Plan and deliver instruction using technology			X	X
Collect data on impact of instruction			X	X
Collect, analyse, and draw conclusions based on data			X	X

Results

The online survey results indicated that over the course of four semesters, candidates developed strong TPACK (see Table 3). Most of the candidates' highest responses were to agree or strongly agree to the questions that they are able to select technologies to use in their classrooms that enhance what they teach, how they teach and what students learn, use strategies that combine content, technologies and teaching approaches that they learned about in their coursework in their classroom, provide leadership in helping others to coordinate the use of content, technologies and teaching approaches at their school and/or district, and choose technologies that enhance the content for a lesson. The highest responses were to agree or strongly agree that candidates can teach lessons that appropriately combine literacy, technologies, and teaching approaches. The lower responses to agree or strongly agree were that candidates can teach lessons that appropriately

combine mathematics, technologies, and teaching approaches, can teach lessons that appropriately combine science, technologies, and teaching approaches, and can teach lessons that appropriately combine social studies, technologies and teaching approaches.

Conclusions

"We are going into a world of education where technology is very present." This was a quote from one of the participants in this study. It speaks to the importance of creating a course that focuses on the development of TPACK. Most of the candidates responded that they were able to select the appropriate technology for their classrooms and students. Candidates were able to combine technology, content, and strategies to enhance the content of their classes. Specifically, candidates scored highest on being to be able to combine literacy and technology into lessons. Moreover, candidates were becoming emerging teacher leaders, helping others to coordinate the use of content. Candidates voiced that they had more difficulty combining mathematics, science, and social studies with technology and this is most likely because they do not have specific methods courses in these subjects. Their elementary methods course focuses more on literacy and general teaching methods. This is an area for growth for this school of education.

Table 3

Survey Questions Pertaining to Technological Pedagogical Content Knowledge (TPACK)

Question	Agree	Strongly Agree	Percent Agree/Strongly Agree
I can teach lessons that appropriately combine mathematics, technologies, and teaching approaches.	46	22	**88**
I can teach lessons that appropriately combine literacy, technologies, and teaching approaches.	51	25	**99**
I can teach lessons that appropriately combine science, technologies, and teaching approaches.	45	21	**86**
I can teach lessons that appropriately combine social studies, technologies, and teaching approaches.	42	22	**83**
I can select technologies to use in my classroom that enhance what I teach, how I teach and what students learn.	50	23	**95**
I can use strategies that combine content, technologies, and teaching approaches that I learned about in my coursework in my classroom.	51	24	**97**
I can provide leadership in helping others to coordinate the use of content, technologies, and teaching approaches at my school and/or district.	51	20	**92**
I can choose technologies that enhance the content for a lesson.	50	23	**95**

Among participant responses, two candidates chose to give oral statements to enhance their online survey answers. Both participants had positive reactions to the study and their ability to now use an LMS system to integrate technology into their lessons. Participant one stated, “Learning how to use D2L in college has been the most underrated skill we learned, just because it’s made it so much easier. There is so much you can do that it’s a little overwhelming as

a new teacher." Participant two had similar responses to the benefit of learning to use an LMS system in college: "D2L has a lot of different gadgets and tools that you use to enhance the classroom and if you don't know how to use them, well, what's the point?" Both participants spoke of how grateful they were to have a foundation in technology as a first-year teacher. Participant one stated "It's been really helpful, and it's something I can say it made me a much better teacher for it."

A common theme among participants was the feeling of being a leader among their colleagues, even as first year teachers. Participant one stated, "I have teachers coming in all the time, that didn't go to the same college as me that are just kinda, almost, they are really overwhelmed, they don't know exactly what to expect and it's nice that they can come see me even in my first year of teaching." Having the knowledge of TPACK gained in this study, participants became leaders that other colleagues felt comfortable asking questions relating to their own gaps of knowledge surrounding an LMS, technology, and online teaching. This makes our graduates stand out in this new era of technology and online teaching. Our education faculty plan to continue in this endeavour of training preservice teachers to be technological and online teaching leaders in their future classrooms. The technology and online teaching landscape will be forever changed due to COVID-19, but our teachers will now be prepared more than ever to provide a successful online teaching environment for their students as well as be technology teacher leaders in their schools. Candidates feel confident in their ability to select and use technology in their future classrooms to enhance what and how they teach and how students learn. As novice teachers, they can provide leadership in using content, technology, and pedagogy at their school and/or district. Also, their education preparation coursework provided them with strategies to combine content, technologies, and teaching approaches that they felt confident in implementing in their future classrooms. This data supports the systematic implementation of technology into the teacher education program. The highest result was how the teacher candidates felt about combining literacy with technology and teaching. This can be attributed to the literacy courses that the candidates take and the reading endorsement that they receive upon graduation. The lower results were how candidates felt about combing mathematics, science, and social studies with technology and teaching. This is an area where faculty can focus future teaching efforts. Candidates do not take specific coursework in the teacher education program pertaining to the teaching of

mathematics, science, and social studies. Therefore, content methods courses should provide more integration in the use of teaching with technology and these content areas.

Further support for teacher candidates' TPACK comes from course evaluations and class discussions which included comments about specific assignments linked to technology integration as being beneficial and generative to future professional growth. A candidate summed up the entire School of Education Technology Integration Project experience as:

> Based on the technology project building my own online class and taking a class online, I feel prepared to use my skills at my field placement. I have also added to my repertoire and abundance of technology tools that can be used to enhance and accommodate students' learning. I have no doubt that I will be able to succeed in utilizing technology tools.

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