Cultivating Future 21st Century Literacy Teachers: An Examination of the Perceptions of Pre-service Teachers and Technology Integration

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Abstract:

Preparing pre-service teachers to teach in the 21st century is the goal of most teaching programs, yet graduating teachers are still entering schools unprepared to use technology in meaningful ways. This research focuses on three cohorts of pre-service teachers who took a three-course literacy block using a modeled approach to teaching literacy with technology. Using a qualitative exploratory design and content analysis (Stelmer, 2001), pre-service teachers' voices were analyzed to investigate what contributes to their understanding of technology integration and how their perceptions are shaped by coursework and field placements. The findings generated important implications about teaching with technology in regard to technology integration not being a one-size-fits-all model, the pre-service teachers perceived confidence being conditional, and exploration opportunities being integral to successful application. This study serves as a foundation to consider how and in what ways technology can be used to help prepare future teachers to be ready for 21st century classrooms.

Keywords: technology integration, pre-service teachers, teacher preparation, 21st century literacy learning

"Today's students need and deserve the skills, strategies, and insights to successfully exploit the

rapidly changing information and communication technologies that continually emerge in the

world" (Larson, 2008, p. 12)

Teaching K12 students the skills and strategies necessary to thrive as active contributors

in a participatory culture (Jenkins, Purushotma, Weigel, Clinton, Robison, 2009) requires

teachers to be adept at integrating technology in seamless ways that both engage learners and

contribute to their growing understanding of 21st century scholarship. Therefore, teacher

educators must illustrate for pre-service teachers how to integrate both innovative technology

and the way it can enhance learning for students. Pre-service teachers are change agents (Kidd,

2013), yet teacher educators cannot assume that pre-service teachers value and utilize digital

technology in meaningful ways on a consistent basis (Hutchison & Wang, 2012).   Future

educators need to understand that, "students are entering an age when knowledge of technology

is a necessity and not a luxury" (Gambrell, Malloy, Marinak, & Mazzoni, 2015). So, it seems

that preparing future teachers to face the unique challenges of teaching in the 21st century is not

only an area of great prominence for teacher educators, but it is also a professional responsibility.

This increased use of digital tools is transforming the way teacher educators can share

information, connect with one another, and what it means to be literate (Beach, 2012).   An

important consideration for teacher educators is how we are preparing pre-service teachers to

teach in the 21st century and how to equip them with the tools and experiences to make a

successful transition into the classroom. The responsibility is then thrust on universities and

teacher educators to prepare future teachers for this changing landscape where the population of

pre-service teachers need experience using and teaching with digital literacies.

The purpose of this study was to investigate pre-service teachers' perceptions of pedagogy

while infusing technology and how their experiences help or hinder their conceptions of teaching

elementary school in the 21st century. Kolb (2008) advocates that pre-service teachers need to be

supported in their technology integration by seeing everyday pedagogical strategies modeled

daily, and this study investigated an approach to elementary literacy instruction that resulted in

pre-service teachers using multiple modalities of technology through exposure and application of

digital literacies practices in both their college classroom and through their field placements.

The primary research question that informed this study is: How do undergraduate pre-service

teachers perceive the inclusion of technology while instructing and assessing elementary literacy

practices? The two underlying questions that helped to clarify pre-service teachers' perceptions

are: 1) What experiences help to shape their beliefs about teaching with technology? and 2) How

do their perceptions shape pre-service visions for future practice? The coursework and

experiences are significant in order to consider how these components work in tandem and also

isolation to contribute to pre-service teachers' perceptions.

Theoretical Framework

The study was grounded using two primary principles: (1) Technology and other media

sources provide elementary students a form of access to text and appropriate instructional tools,

and (2) Pre-service teachers are actively constructing their own vision for future practice during

coursework and fieldwork. Mishra and Koehler's (2006) TPACK Framework (Teacher

Pedagogical Application of Content Knowledge) help to substantiate these principles about pre-

service teachers' understandings of technology integration. The TPACK (Mishra &Koehler,

2006) framework delineates the knowledge a pre-service teacher must have in order to

effectively deliver instruction where technology enhances learning. The TPACK framework

describes the coinciding areas of knowledge that are integral for teachers to teach content

effectively with digital mediums and applications. The TPACK is illustrated using three

overlapping circles of knowledge: pedagogy, content knowledge, and technology. The

intersection of all three circles is the goal for instruction where teacher knowledge and

instruction promote elementary students' development of digital literacy practices. Grounding

instruction using the TPACK framework helps teacher educators conceptualize how technology

can be incorporated into teaching and learning. It allows teacher educators to carry out effective

instruction, but also addresses the personal and social influences that are integral to make

teaching with technology meaningful and sustainable.

A separate construct uses the work from pre-service teacher beliefs and vision (Mercado

& Turner, 2010; Vannatta, 2000) and the growing body of literature regarding technology

integration among pre-service teachers (Abbitt, 2011; Koehler & Mishra, 2009). An important

consideration is also how action research has aided pre-service teachers in their inquiry and

evaluation of teaching practices (Hagevik, Aydeniz, & Rowell, 2012; Hulse & Hulme, 2012).

Although the TPACK (Mishra & Koehler, 2006) provides the foundation to consider the

knowledge pre-service teachers must draw upon, it is also important to understand that pre-

service teachers often struggle to integrate technology in their field experiences due to

pedagogical complexities and educational contexts (Dawson & Dana, 2007). Yet, researchers

find that opportunities for pre-service teachers to utilize technological tools in field experiences

encourage technology integration and help shape perceptions and attitudes toward technology

integration (Mason, 2000).

Students' understanding of text and literacy practices continue to involve digital mobile

devices (Cardullo, 2013; Wilson, Briere, & Nahachewsky, 2015), and researchers identify that

eBooks and mobile devices can change the face of education (Neuman & Gambrell, 2014).   Part

of developing pre-service teachers' TPACK (Mishra & Koehler, 2006) involves allowing pre-

service teachers' learning about technology through modeling and engagement (Vannatta, 2000)

and developing a high level of digital literacy themselves while simultaneously learning how to

use a range of technologies within digital pedagogies (Milton & Vozzo, 2013). Most importantly,

if pre-service teachers can navigate the technological landscape, they can help their students

understand how to draw upon various modes to meet the challenges of the twenty-first century

(Borsheim, Merritt & Reed, 2008).

These frameworks are important to pre-service teachers and illustrate the many areas of

knowledge a teacher must possess in order to be successful in teaching content with

technology. For a pre-service teacher, these areas of expertise are developing.   As teacher

educators consider the TPACK and the overlapping areas of expertise necessary to thrive in 21st

century classrooms, it would seem obvious that any teacher new to the field would struggle to

teach without opportunities to apply those simultaneous understandings. Therefore, it is

important to support them in their exploration of how to integrate technology and to find ways to

problem-solve while using their developing knowledge.

Methodology

This study sought to understand undergraduate pre-service teachers' perceptions about

technology integration, and a qualitative research design was employed to collect data to answer

the research questions (Patton, 2002). This method allowed for the analysis to reveal the pre-

service teachers' contextual worlds through their experiences. This qualitative research analyzed

how the experiences of pre-service teachers helped to shape their visions for future practice.

Partial class time was spent sharing, modeling and then later scaffolding the use of different

websites and applications during content area methods instruction.

Selection of Participants

This study took place at a small, suburban commonwealth campus with approximately

3200 students. During the junior year, elementary education pre-service teachers are enrolled in

a three-course literacy methods block and a corresponding 2-day field placement for two hours

each day. The PSTs were from three cohorts with ten to twelve PSTs in each cohort. The

participants were recruited from the PSTs during their senior year once they had already

completed their junior-year coursework. The first cohort was conducted as a pilot study and

consisted of 11 PSTs. The remaining 23 PSTs were participants in the larger study that helped to

broaden and fill out the themes originally developed through the pilot study.

The senior year placements are in stark contrast to the junior-year experience because the

placements are in under-resourced schools. This divergence from the PSTs' junior-level

placement made it important to build a sense of how the pre-service teachers perceived their

TPACK knowledge when faced with the realities of their current urban school placements with

limited abilities of implementing technology. This massive divergence between field experiences

offers a space to reflect on what they learned and how it helped cultivate the pre-service

teachers' visions of future practice.

Modeled Approach to Technology Integration

During the three-course literacy block numerous opportunities for modeling, exploration,

and application were given to the pre-service teachers for both instructional and assessment

purposes. Pre-service teachers explored various web sites and applications through classroom

activities and assignments. The assignments incorporated the concurrent elementary field

experience placements where the pre-service teachers provided a limited amount of instruction to

children and used classroom experiences to implement class assignments in placement

classrooms. Table 1 below outlines the courses and the technological applications introduced and

applied in the courses. It illustrates examples that were used in class and the assignments that

demanded technological literacy knowledge. The list below is not exhaustive but highlights

some of the ways PSTs were exposed to different tools expanding on literacy

objectives.

Table 1: Digital Applications and Assignments for Junior Block

Literacy Course Name	Examples of Digital Applications and Websites	Assignments utilizing Technical Applications
Teaching Reading in Elementary Schools	- Shadow Puppet app - Sock Puppets app - Chatterpix app - www.popplet.com - Trading cards app - Talking hippo app - Glow Paint app - Nearpod app	- Website development - Research technological application
Teaching Writing in Elementary Schools	- www.pixton.com - www.emaze.com - www.kidblog.com 30 Hands app - CapDis app - Book Creator app - www.twitter.com - www.wonderopolis.com	- Digital photo journal - Action research with technological application - Blogging
Teaching Children's Literature	- www.arounder.com - Goosechase app - News-o-Matic app - Epic app - QR scanner/generator - Socrative app - www.pinterest.com - www.padlet.com - Photo collage app	- iMovie creation - Action research/inquiry findings about technological application

This approach was developed to include technology in the pre-service teaching

experience. Currently, no educational technology courses exist in the elementary education

program for the pre-service teachers. Integrating technology into pre-service teacher education

through the use of modeling, using, implementing, and applying their learning, the pre-service

teachers are able to develop their own TPACK (Mishra & Koehler, 2006) knowledge so they can

create instruction that is focused on literacy goals rather than the technology they use.

Data Sources

Anecdotal records, artifact analysis, questionnaires and focus group interviews were the

methods of data collection used consistently with qualitative research design (Merriam, 2002).

The data collection and analyses aimed to clarify how pre-service teachers perceived their

experience and to understand whether their experiences helped or hindered their general

conceptions of teaching literacy with technology. Anecdotal records were taken during class

sessions where the pre-service teachers were using different websites and applications. The

researcher recorded observations of the pre-service teachers' reactions, discussions and overall

use of the technological tools to teach literacy concepts. The researcher also collected a baseline

reflection regarding the role of technology on literacy instruction at the beginning of each

term. A final vision statement was collected at the completion of the course and was later

analyzed to identify patterns about their beliefs for future practice.

A questionnaire adapted from Schmidt, Baran, Thompson, Koehler, Shin, and Mishra

(2009) , which was correlated with the TPACK framework was distributed to the consenting

participants. The questionnaire included both closed-ended Likert scale survey items as well as

several open-ended questions. Focus group interviews were conducted following the

administration of the questionnaire to gather more information about the pre-service teachers'

experiences and gather contextual evidence about their reflections. The interviews captured a

more thorough understanding of the artifact analysis and provided an in-depth discussion of the

pre-service teachers' beliefs about their perceived role of technology in classroom

instruction. Focus group interviews give researchers an opportunity to view the world we do not

experience ourselves (Krueger & Casey, 2008). The importance of capturing the pre-service

teachers' beliefs was an attempt to more profoundly understand the phenomenon being

investigated.

Data Analysis

The researcher analyzed the data with specific strategies and across multiple sources in

an ongoing and systematic manner using content analysis (Taylor-Powell & Renner, 2003) to

identify categories and patterns of how pre-service teachers perceive teaching in the 21st century

and what shaped those conceptions. Assertions generated from across all data sources and

interpretive commentary connected the assertions. Merriam (2002) describes content analysis as

analyzing interviews, field notes, and documents so a researcher can seek to find themes and

reoccurring patterns of meaning. The researcher transcribed the interview data after listening to

the recordings several times, looking at the information from different lenses. The researcher

looked for counterpoint evidence and identified emerging categories. The researcher continued to

compare categories and themes from each of the data sources within and between artifacts to

look for patterns and outliers. Descriptive statistics were used for the survey items to analyze the

pre-service teachers' responses and look for patterns in their perceptions about teaching with

technology. The researcher triangulated the different data sources through the comparison of

multiple data sources. The multiple sources confirmed interpretive accuracy and validated the

themes. As a means of maintaining reliability, the researcher also used member checking with

participants.

Role of the Researcher

Data collection took place with one course instructor. I was both the instructor and the

researcher in this study. The role of the qualitative researcher ranges on a continuum from a

fully-present researcher and a co-participant, to a researcher who experiences the investigation,

without being fully involved in the events (Rossman & Rallis, 2003). I had an active role in the

study because I am the course instructor implementing this specific technology-driven approach

to literacy instruction. I tried to extricate myself as the center of this work by collecting data

following PSTs' coursework and by also allowing them to speak freely about their experiences.

Therefore, I collected data after grades were submitted so there would not be evidence of

coercion. Creswell (1998) suggests that the qualitative researcher often takes on the role of the

active learner and tells a story from the participants' point of view, rather than an expert passing

judgment. The researcher's role as an active learner is especially important in today's literacy

classrooms. Often, the researcher's own knowledge, within the context of observation or study,

constrains or broadens what he/she can observe, and, therefore, he/she is in a position to explain

and theorize (Steinkuehler, Black, & Clinton, 2005).

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Findings

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This study offered an opportunity to understand the PSTs' perceptions more profoundly

outside of their junior block experience. The themes generated new insights and offered rich

descriptions to clarify the pre-service teachers' perceptions regarding the preparation of future

teachers using technology. The themes identified through the data analysis are: 1) Technology

integration is not one-size-fits-all, 2) PST technology confidence is conditional, and 3) Literacy

block learning should include opportunities for technology play/exploration. These themes help

to generate new insight into how pre-service teachers experience technology integration as

students yet reflecting on its use as teachers.

Technology Integration Is Not One-Size-Fits-All

Pre-service teachers shared that they noticed a disconnect between what they learned the

previous year and what they had anticipated to use for their senior-year placements and beyond.

It did not take long for the pre-service teachers to realize that sometimes learning about

technology is how *not* to use it. Teaching with technology does not automatically mean that

student learning will be better and the artifacts will be meaningful. During their junior-year the

PSTs experienced a model for technology integration that followed Puentedura's (2006) work,

which hinged on the SAMR model. The aim of this approach to technology integration is that

technology and digital applications should only be used when they can modify and/or transform

student learning and outcomes. The PSTs noted that the junior-year placements used technology

differently than those in the urban schools during their senior year. They identified that the

technology-use in the suburban school was much more meaningful and relevant. For instance,

the student artifacts were entrenched in some kind of literacy practice.

The pre-service teachers' urban, senior-year placements were much different. They

noticed that the focus of technology integration typically associated with district pre-purchased

programs and sometimes had no purpose other than to be an "add-on." In many cases the

technology was linked to a district-mandated basal program.   Jaime mentioned, "We use

programs like Reading Eggs… but it doesn't get linked to anything else we do." Donna

reiterated, "We put on videos and then just move on to something else." The PSTs reflected

about how technology *should* be used in classrooms, and they were concerned about the

relevance of the technology practices they were experiencing. Felicia remarked, "Throwing

elementary students on the computers because the school paid for them doesn't make it

meaningful."   Another PST shared, "We use the Promethean Boards but there are other things

we can probably do that would be meaningful and make it more engaging." They identified that

it was a problem when using the Promethean Board typically left the majority of the students at

their seats with nothing to do while only one student worked with the board, and they discussed

ways this activity could be enhanced using magnetic letters. Furthermore, the mentioned the gap

that existed between the two field placement experiences, noting that not having access to the

same digital tools does not mean that the technology integration has to be less meaningful.

Brooke shared, "Many of the same experiences could be done with one computer, but my teacher

just uses the computer for practice games." Jess echoed that sentiment by adding, "The kids

could create something or use the computers to go on virtual field trips or research different

things." The pre-service teachers clearly recognized that the SAMR criteria for technology to

modify or transform instructional practices was not being met.

One of the major findings is that technology experience and learning that took place the

previous year in one context was not yet applicable in their current context because of some of

the constraints they faced. For instance, they found it difficult to make the connections

themselves. The PSTs described their mentor teachers as not being comfortable using

technology. Practicing teachers often find it difficult to integrate technology into instructional

practices (Turbill & Murray, 2006). In this case, both the mentor teachers' discomfort and the

PSTs' disconnect from what they had previously learned contributed to digital tools not being

utilized appropriately. There was an understanding that what they had learned the previous year

could not just be replicated in another context.   This awareness is incredibly important as they

navigate a space where they understand that a meaningful integration of technology is going to

look and feel differently in different learning spaces.

Tech Confidence is Conditional

Although the PSTs had a high level of confidence about technology integration, there was

a limitation to that heightened sense of self-assurance. The pre-service teachers' confidence

hinged on the belief that they may have relevant technological knowledge worthy of sharing with

others. The questionnaire revealed that the PSTs had an increased confidence following the

LLED block (mean of 4.25 on a 5-point scale). They felt much less confident in providing

leadership to others related to technology integration (a mean score of 3.17).   This finding is

especially important considering that they had already identified that their mentor teachers were

not comfortable using technology. If they were not confident in providing leadership, then they

will be less likely to try something different than what their mentor teacher was doing, or even

showing their mentor teacher a new way to incorporate a digital tool.

Clearly the introduction to different tools and the technology experience during the PSTs'

junior year is a small part of what could be integrated because the tools and resources that could

potentially be incorporated into classrooms is endless. Yet, the PSTs had a diverse digital toolkit

to begin to utilize, but they still felt ill-equipped to universally integrate technology with

complete confidence. Their confidence using different tools was subject to the tool's relevance.

As an example, Stella shared, "If I am in a school that does not provide me with professional

development with the technology *they* use I don't know how confident I will be." Similarly,

Felicia recounted, "Last year I felt confident but this year I am a bit doubtful of my own abilities

because the only experience we had with technology was in our literacy courses junior

year." Fortunately, Laura had a number of technology-rich experiences in her multiple field

placements and said, "I feel confident because I have seen so many different things being done in different placements. I have a number of experiences to draw from." Jess recounted, "Although my cooperating teacher did a lot of work with the iPads and Chromebooks, I just don't remember some of the specifics. I remember a few of the apps, but I don't feel like I know enough to share the information with my cooperating teacher." The pre-service teachers' confidence was site and experience-specific. They had difficulty feeling confident about their technological knowledge in a new context where technology was being used differently.

They found that the experiences during their senior year focused on programmatic connections that did not help them increase their understanding of how to meaningfully deliver literacy instruction using technology thus limiting their knowledge and confidence. A teacher educator goal of providing multiple tools, experiences and connections is to allow pre-service teachers to build their TPACK knowledge (Mishra & Koehler, 2006) while another important goal is to build their confidence using technology. Unfortunately, PSTs' confidence hinges on unmanageable variables from different contexts. The rich experiential learning afforded to the PSTs did not sustain them through the technology terrain of another school context.

Technology Exploration is Essential

Being immersed in opportunities to explore digital tools and reflect about how they work in different contexts helped shape the PSTs' understandings about how technology can be integrated into elementary content-area instruction. For example, Talia remarked, "I used to think that technology hinders education more than it enhances it, but now I think that meaningful uses with technology can help make instruction more focused." The pre-service teachers spoke specifically about the course assignments that helped illustrate the ways in which technology could meaningfully support instruction and assessment. Two of the projects that were mentioned

were the iMovie and the technology-integration action research project. Figure 1 is a screen shot

the iMovie Talia produced for her second-grade field placement classroom. She was able to

effectively integrate technology into a literacy lesson related to a unit on the life cycle of a
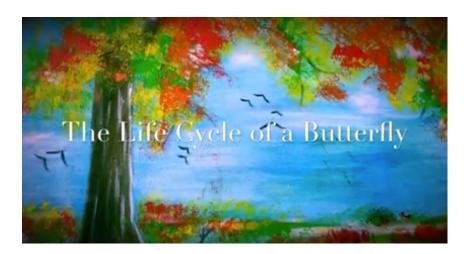
butterfly.

Figure 1: iMovie Example for Pre-Service Teacher

Similarly, Felicia remarked, "Our technology-integration action research project offered me an

opportunity to explore forms of online collaboration in classrooms with full support from our

instructor, which I would not have time to do in another situation." She commented about being

afforded that opportunity and how it offered her a valuable learning opportunity to reflect on

what she could do differently with elementary students in her own classroom. Felicia designed

her technology inquiry project around the use of Google Expedition with third grade students.

She learned about the preparation, the teaching, the modeling needed, and the pitfalls one can

face. This opportunity allowed her to experience a redefining task (Puentedura, 2006) that would

not have not been possible without the technology.

The pre-service teachers discussed specific applications used during the junior methods

coursework and the ways the apps and sites were used in class and also how they could be used

with elementary students. The application of certain digital tools such as Goosechase (an online

scavenger hunt) and Shadow Puppet (a video-creation tool) offered the pre-service teachers

different opportunities that were aligned to authentic tasks for specific teaching purposes. Not

only were they modeled, but the PSTs were given a specific task relevant to course content they

needed to complete using these (and other) tools. They were also given time to reflect about

these experiences and how they might be used in elementary classrooms. The PSTs were also

given space to explore other self-identified digital tools and share those with one another. Figure

2 is a screen shot from a class activity that demonstrates how the PSTs' were able to

multimodally define literacy. They combined using an applicable app with a meaningful task,

thus having them collaborate about what it means to be literate in today's classrooms.

Figure 2: "What is Literacy?" Activity

The PSTs also identified that, "Collaboration is essential," identifying the importance of working

together and building from one another's ideas. Stella shared, "I think about the inquiry project I

did last year with blogging… I would never be able to do that in my current placement because

we only have 6 laptops available." Laura also iterated, "We had the space to do the action

research projects… we had opportunity, guidance, feedback and time." Brooke reported, "We

were able to work a partner on most of our projects so we could use each other to build our

ideas." Stella again shared, "The time we had to share our ideas with the whole group, ask

questions and give suggestions gave me direction when I was stuck." The pre-service teachers

valued these types of opportunities, and felt the time and integration of content, pedagogy and

technology allowed them to use different elements of technology. Muharis & Ziemke (2015)

advocate that teachers should use some element of a digital playground when allowing students

"try" different digital tools. The "play" time and means for applying digital tools in different

ways is essential to allowing PSTs a chance to understand the uses for different technological

while experiencing some of the pitfalls that may exist.

Discussion

The findings from this study help connect important points for discussion related to the

research questions. Martin (2008) describes digital literacy as

the awareness, attitude and ability of individuals to appropriately use digital tools and

facilities to identify, access, manage, integrate, evaluate, analyze and synthesize digital

resources, construct new knowledge, create media expressions, and communicate with

others, in the context of specific life situations (p. 167).

Our job in educating future teachers is to reflect on how teachers can do this while teaching our

particular pedagogy. One of the important findings from this study identified not only issues

related to technology but also the inequities between the different schools where the pre-service

teachers were placed. One experience was more meaningful because of a number of factors that

included: 1) it had more technology available, 2) there was more support for teachers to learn

new technologies and take risks, and 3) it allowed PSTs to work together to engage in innovative

practices. The combination of the two divergent field placements was valuable for the PSTs

because they had experience with a technology-rich school context and one with limited means.

It also illustrates the need for teachers to be responsive in providing meaningful and varied

opportunities with technology.   Varied opportunities need multiple approaches to teaching using

technology. In particular, the PSTs of tomorrow's schools need to learn how to integrate

technology in *all* school contexts, whether there is limited or an overabundance of access to

technology and digital tools. Specifically, as teacher educators we need to provide experiences

where pre-service teachers learn how to promote digital equity and enrich opportunities for

elementary students having access to only one iPad or a finite number of devices (Author &

Turner, 2018).

The findings reveal that the pre-service teachers found great value in being exposed to

different digital tools and opportunities to problem-solve, explore and generate a technology-

based inquiry finding their own answers, which is an important 21st century skill. Toyoma (2015)

proposes that technology in education should, "amplify whatever pedagogical capacity is already

there." Teacher educators need to move into redefining technology integration by providing

opportunities to demonstrate how teachers can create new tasks that only digital tools can help to

support, transforming teaching and learning with technology. Using the TPACK model (Mishra

& Koehler, 2006) helps to provide general understandings where teachers, faculty members and

schools can show specific uses to augment, modify and redefine instruction using technology.

Specifically, in this context, by using the TPACK as a model for course design and instruction,

technology modeling and application was a built-in part of the literacy methods coursework. It was not an add-on, but rather the goal was to use the overlapping circles of knowledge as the foundation for course design, activities and assignments.

It is important to provide both general and more focused tools and opportunities. Similarly, there should be opportunities for discussion and exploration to determine different ways of using different tools. By providing time to reflect, pre-service can begin to unpack and discuss how the experiences in a digital-rich school could be applied and adapted for students in a school with limited technology and resources so they could also experience the same important 21st century learning. PSTs need to take risks and try strategies that incorporate content knowledge, pedagogical knowledge and technological knowledge regardless of the teacher whose classroom the PST is placed in and the field placement.

These findings indicate that pre-service teachers each valued their experiences exploring, practicing and integrating technology into instruction and assessment. Even pre-service teachers who did not embrace technology and noted that they were "technologically challenged," later commented that technology has the potential to enhance literacy instruction. They valued the opportunity to try different tools in different contexts while applying relevant literacy skills. They similarly appreciated using different apps and digital tools *with* students, thus illustrating how teacher educators can help to form PSTs' growing TPACK incorporating pedagogy, content knowledge, and knowledge of technology. The PSTs recognized that technology needs to be used in meaningful ways for authentic purposes. For instance, allowing elementary students to create multi-media book teasers to illustrate their understanding of a book applies a number of both traditional and 21st century literacy skills. The findings reveal that the PSTs have varying

degrees of what the technology integration will look like based on their own personal and

professional experiences, yet they look forward to future professional development to continue

their growth.

Implications for Teacher Educators

In consideration of the research questions and what it means for future and practicing

teachers, it is important to consider a few implications for teacher educators and 21st century

teacher preparation. First, because technology is not a one-size-fits-all blanket that can be

applied to any school context, it is important to demonstrate for PSTs ways in which they can use

technology to teach their content as well as offer them a means to reflect and problem-solve

when they are in school contexts with limited means. One way to offer PSTs some additional

support is through introducing them to resources available on the web such as those on social

media, through podcasts and blogs, and through YouTube channels (Author & Turner, 2018).

Similarly, as teacher educators are cultivating spaces where technology integration is meaningful

and relevant, they can model how teaching with digital tools is about transforming instructional

and assessment practices to prepare *all* students to think critically and fully participate in 21st

century classrooms. So instead of university faculty asking PSTs to put their technology away in

classrooms, they can instead teach them *how* to use it appropriately during lectures and

classroom activities. For instance, the use of Twitter, back channels, and text organization

applications can be illustrated and applied. Creating a space for social networking or

collaboration among PSTs will enable them to problem-solve and also support their continued

growth.

The goal of technology integration is to illustrate enriching experiences for K12 students.

It should take them outside the classroom, into spaces that expand their thinking and deepen their

schema. Puentedura's (2006) work with the SAMR model (Substitution, Augmentation,

Modification, and Redefinition) offers teacher educators a vehicle for using integrative practices.

The goal is to redefine instruction, allowing PSTs a space to create learning tasks and

assessments where technology is used in ways otherwise inconceivable. An example of this is

having elementary students creating multimedia content as a means of assessing understanding.

The learning that occurs when a student creates an iMovie is far more consequential than writing

a paper about instruction and assessment. Opportunities such as these can help to boost

confidence, and similarly provide an application-based learning environment where PSTs can

add to their growing TPACK. Similarly, by offering PSTs time to put the pieces together, to

process and to share how technology is being used (and not used) in classrooms we as teacher

educators can provide a space to problem-solve and share possible solutions to the challenges in

today's classrooms. By offering PSTs opportunities to discuss and reflect we are offering them a

chance to learn from one another. Hicks and Turner (2013) said it best: "Digital literacy is no

longer a luxury, and we simply cannot wait to build the capacity in our students and colleagues,

as well as ourselves" (p. 64).

        Since the researcher was also the course instructor and therefore able to use the results of this study to

inform instruction, there have been multiple adaptations to the courses. A few of the enhancements for the literacy

methods coursework involves the means and dissemination of the assignments and activities that utilize technology.

For example, in lieu of submitting papers to the course instructor as a means of reflection, the PSTs instead post to

an online portfolio site that is often used in elementary classrooms. The course uses the online app/platform Seesaw

to post and reply to one another's reflections about their literacy field experiences. Similarly, the course now

requires the PSTs to blog and connect in professional learning community (PLC) groups similar to an elementary

classroom. This exercise helps them write for a different audience and learn how to connect and collaborate with

peers. The collaboration has extended beyond the typical university classroom walls, and the PSTs now connect

with other PSTs at a university across the country while they explore technology integration through collaborative

blogging. As a result, the across-university blogging resulted in an expansion of the PSTs' professional learning and

also served as a conduit for meaningful technology use (Author, Friedrich & Appleget, 2018). Another course

enhancement is the way in which the PSTs evaluate and integrate digital tools. The PSTs are now required to curate

a selection of apps and websites to consider the multiple groups of students they may encounter and the apps'

important considerations including: strengths, weaknesses, (teaching) opportunities, and threats (SWOT). As this

course continues to be adapted, PSTs will need to align their lessons to state standards and also specifically address

how the International Society for Technology in Education (ISTE) standards will be aligned through their lessons in

order to make the technological integration intentional and be aligned to the instruction and assessment outcomes for

the curriculum.

Conclusion

This study is important because it identifies a growing professional need for teacher

educators to include technology into education methods courses. Given modeling, a chance for

exploration, opportunities for application and a means to demonstrate growing knowledge of

content and pedagogy through technological approaches, pre-service teachers can identify their

role in delivering appropriate instruction utilizing technological mediums. Through

communication and dialogue occurring between groups of pre-service teachers they can glean

important insight, share relevant challenges for technology integration and create experiences to

make meaningful experiences for their students. This work illustrates how pre-service teachers

perceive technology integration and how it begins to unpack what considerations, experiences

and opportunities help to prepare future teachers for the changing climate of schools. In

addition, it illustrates the ways in which teacher educators can enhance their content methods

coursework to include technology. Twenty-first century learning is an important goal, yet the

onus relies on teacher educators to adequately prepare those facing the future classrooms.

References

Abbitt, J. T. (2011). Measuring technological pedagogical content knowledge in pre-service

    teacher education: A review of current methods and instruments. *Journal of Research on*

    Teaching in Education, 43(4), 281-300.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change.

    Psychological Review, 34(2), 191-215.

Borsheim, C., Merritt, K., & Reed, D. (2008). Beyond technology for technology's sake:

    Advancing multiliteracies in the twenty-first century. *The Clearing House, 82(2),* 87-90.

Cardullo, V. (2013). *Eighth-grade students reading nonfiction literature on the iPad: An*

    exploratory case study. (Unpublished doctoral dissertation). University of Central

    Florida, Orlando, FL.

Coiro, J., Knobel, M., Lankshear, C., & Leu, D. J. (2008). Central issues in new literacies and

    new literacies research. In J. Coiro, M. Knobel, C. Lankshear, and D. J. Leu. *The*

    handbook of research on new literacies. (1-22). Mahwah, NJ: Erlbaum.

Creswell, J. W. (1998). *Qualitative inquiry and research design: Choosing among five designs*.

    Thousand Oaks, CA: Sage.

Dawson, K. & Dana, N. F. (2007). When curriculum-based technology enhanced field

    experiences and teacher inquiry coalesce: An opportunity for conceptual change? *British*

    Journal of Educational Technology, 38(4), 656-657.

Hagevik, R., Aydeniz, R., & Rowell, C. G. (2012). Using action research in middle level teacher

    education to evaluate and deepen reflective practice. *Teaching and Teacher Education,*

    28(5), 675-684.

Hicks, T., & Turner, K. H. (2013). No longer a luxury: Digital literacy can't wait. *English*

    Journal, 102(6), 58-65.

Hulse, B., & Hulme, R. (2012). Engaging with research through practitioner enquiry: the

    perceptions of beginning teachers on a postgraduate initial teacher education programme.

    Educational Action Research, 20(2), 313-329.

Gambrell, L.B., Malloy, J.A., Marinak, B.A. & Mazzoni, S.A. (2015). Evidence-based best

    practices for comprehensive literacy instruction in the age of the Common Core

    standards. In. L.B. Gambrell & L.M. Morrow (Eds.), *Best practices in literacy*

    instruction (5th ed., pp. 37-60). New York, NY: Guillford.

Jenkins, H., Purushotma, M., Weigel, K., Clinton, K., & Robinson, A. J. (2009).

    Confronting the challenges of participatory culture: Media education for the 21st

    century. Cambridge, Mass.: MIT Press.

Koehler, M., & Mishra, P. (2009). What is technological pedagogical content knowledge?

    Contemporary Issues in Technology and Teacher Education, 9(1), 60-70.

Kolb, L. (2008). Developing everyday technology pedagogy in pre-service teachers,

    Paper presented at the American Educational Research Association annual meeting, New

    York.

Krueger, R., & Casey, M. A. (2009). *Focus groups: A practical guide for applied research.*

Fourth Edition. Thousand Oaks, CA: Sage Publications.

Larson, L. (2008). Electronic reading workshop: Beyond books with new literacies and

instructional technologies. *Journal of Adolescent and Adult Literacy, 52(2),* 121-131.

Leu, D. J., Jr., Kinzer, C. K., Coiro, J., Cammack, D. (2004). Toward a theory of new literacies

emerging from the Internet and other ICT. In R.B. Ruddell & N. Unrau (Eds.),

Theoretical Models and Processes of Reading, Fifth Edition (1568-1611). Newark, DE:

International Reading Association.

Martin, A. (2008) Digital literacy and the 'digital society'. In C. Lankshear and M.

Knobel (eds) *Digital Literacies: Concepts, Policies and Practices.* New York: Peter

Lang, pp. 151–76.

Mason, C. L. (2000). Online teacher education: An analysis of student teachers' use computer-

mediated communication. *International Journal of Social Education, 15(1),* 19-38.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A

framework for teacher knowledge. *Teachers College Record, 108(6),* 1017–1054.

Mercado, R. & Turner, J. D. (2010, April). *New teachers' visions of culturally responsive*

reading instruction. Poster presented at the 55th annual convention of the International

Reading Association, Chicago, IL.

Merriam, S. (2002). *Introduction to qualitative research.* San Francisco, CA: Jossey-Bass.

Mossberger, K., Tolbert, C. J., & McNeal, R. S. (2008). *Digital citizenship: The internet, society*

and participation. Cambridge, MA: MIT Press.

Milton, M., & Vozzo, L. (2013). Digital literacy and digital pedagogies for teaching literacy:

Pre-service teachers' experience on teaching rounds. *Journal of Literacy and Technology*

14(1), 72-97.

Neuman, S. B., & Gambrell, L. B. (2014). Disruptive innovations in reading research and

practice. *Reading Research Quarterly, 50(1),* 7-12.

Patton, M. Q. (2002). *Qualitative research and evaluation methods*. Thousand Oaks, CA: Sage

Publications.

Rossman, G. B., & Rallis, S. F. (2003). *Learning in the field: An introduction to qualitative*

research (2nd ed.). Thousand Oaks, CA: Sage.

Schmidt, D. A., Baran, E., Thompson A. D., Koehler, M. J., Mishra, P. & Shin, T.

(2009). Technological Pedagogical Content Knowledge (TPACK): The Development and

Validation of an Assessment Instrument for Preservice Teachers. *Journal of Research on*

Technology in Education, 42(2), 123-149.

Serafini, F. (2014). *Reading the visual: An introduction to teaching multimodal literacy*.

New York, NY: Teacher's College Press.

Steinkuehler, C. A., Black, R. W., & Clinton, K. A. (2005). Researching literacy as tool, place,

and way of being. *Reading Research Quarterly 40(1),* 95-100.

Stelmer, S. (2001). An overview of content analysis. *Practical Assessment, Assessment &*

Evaluation, 7(17), 137-146.

Toyama, K. (2015). Technology won't fix America's neediest schools. It makes bad education

worse. *The Washington Post* online, June 4. Accessed April 8, 2016 at

http://www.washingtonpost.com/posteverything/wp/2015/06/04/technology-wont-fix-

americas-neediest-schools-it-makes-bad-education-worse/.

Turbill, J. B., & Murray, J. (2006). Early literacy and technologies in Australian

schools: Policy, Research and Practice. In M. McKenna, L. Labbo, R. D. Kieffer & D.

Reinking (Eds.), International Handbook of Literacy and Technology Volume 2 (pp. 93-

108). Mahwah, New Jersey, USA: Lawrence Erlbaum Associates.

Vannatta, R. A. (2000). Integrating, infusing, modeling: Preparing technology-using

educators. *Journal of Computing in Teacher Education, 16(2),* 6-14.

Wilson, J. R., Briere, J. L., & Nahachewsky, J. (2015). Rural high school students' digital

literacy. *Journal of Literacy and Technology, 16(2),* 55-77.