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TEACHER TECHNOLOGY SELF-EFFICACY AND ITS IMPACT ON
INSTRUCTIONAL TECHNOLOGY INTEGRATION

By
Paige Mitchell

A Dissertation Submitted to the
Gardner-Webb University School of Education
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Education

Gardner-Webb University
2020

Approval Page

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Acknowledgments

“Therefore encourage one another and build one another up, just as in fact you are doing”

1 Thessalonians 5:11 (NIV)

I would like to acknowledge the love and support of my family. You have supported through this long journey and not once given up on me. To my husband, Justin, you have listened to all my frustrations and moments of giving up, yet you continue to push me forward. To my children, Connor and Caroline, thank you for continuing to love me through this process and cheering me on from the side. I hope I can be an example to you that you can set your goals high and if you work hard, you can accomplish whatever you set your mind to.

Thank you Dr. Sydney Brown for your guidance and feedback through this journey. Your patience and gentle sideline pushing has gotten me to where I am. Thank you to my cohort group for the many encouragements along the way. We are all #drsinthemaking.

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Abstract

TEACHER TECHNOLOGY SELF-EFFICACY AND ITS IMPACT ON
INSTRUCTIONAL TECHNOLOGY INTEGRATION. Mitchell, Paige, 2020:
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This study is an extension of Slutsky's (2016) dissertation about technology self-efficacy. The purpose of this study was to extend the generalization of the original study, considering the knowledge of teacher technology self-efficacy as it relates to integrating technology in the classroom. I built on previous research and added related knowledge to the original study. This study examined teacher levels of technology self-efficacy, identified specific factors affecting their current level, and examined the role and impact professional development opportunities have on technology self-efficacy.

Keywords: teacher self-efficacy, technology integration, technology efficacy, 21st century learning, technology in education

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Chapter 1: Introduction

Introduction

Now more than ever, society has become dependent upon digital technologies to stay connected to the world. Education is no different. Many students in schools today can be observed walking through hallways with a cellular phone attached to one hip and headphones lodged into one or both ears while they listen to music. As a result of technology's influence on adolescents today, young people expect to be merely a mouse click or a Google search away from the information they seek.

To meet students where they are, it becomes increasingly important for educators to tap into the digital world of students and engage them through one of the numerous technologies available to them (Hoveling, 2016; Liu et al., 2017; U.S. Department of Education, 2010). Using technology for instructional purposes may have widespread, positive effects on students (Shell et al., 2005). Additionally, when students use technology in an exploratory/inquiry sense, they are actively engaged in their learning because they are interacting with their preferred medium of learning (Center for Educational Innovation, 2019).

While technology enhances the learning environment, the technological advancements of the late 20th and early 21st centuries have created an environment in which technology has become increasingly intertwined with curriculum and pedagogy (Moll, 2019). Today, teachers are in the midst of a pedagogical revolution: “Teachers need to be explicitly taught how the unique affordances of technology can be used to enrich subject domains for specific learners and ... about interactions among pedagogy, content, and technology to develop their technological pedagogical content knowledge”

(Clark, 2013, p. 43). Many teachers are aware of the technology that is available to them for instructional purposes, yet for one or more reasons, teachers are not capitalizing on the opportunity to integrate such resources into their classrooms. Previous studies have identified several reasons for underutilized technology including but not limited to lack of resources, lack of training, philosophical beliefs about technology, and lack of time to experiment with technology tools (Cakir, 2012; Farah, 2012; Kellenberger & Hendricks, 2003; Littrell et al., 2005; Moore-Hayes, 2011; Teo, 2009; Wang et al., 2004). Many researchers attribute underutilized technology to teacher lack of self-efficacy in incorporating such resources into their classrooms (Huntington, 2011; Kellenberger & Hendricks, 2003; Kopcha, 2012; Prensky, 2001). Educators who feel uncomfortable using technology are unlikely to incorporate it because of the fear associated with using something with which they have limited experience (Prensky, 2001; Roach, 2010).

Theoretical Framework

Self-efficacy has a theoretical foundation grounded in social cognitive theory and was developed by Bandura (1977). Bandura (1977) explained that self-efficacy refers to one's beliefs in one's capabilities to organize and execute the courses of action required to produce a given outcome. Using Bandura's (1977) self-efficacy definition, self-efficacy plays a role in the behavior one chooses to demonstrate. If one believes that they are incapable of performing a particular action, they may not attempt to carry out said action. Bandura (1977) also discussed that self-efficacy theory is a common theme concerning motivation, mostly as a result of its power to predict one's behavior.

In holding to this concept of self-efficacy and realizing the predictive power it has on behavior, there is value in examining factors that affect self-efficacy and desired

behaviors. In an educational sense, then, understanding teacher self-efficacy concerning various instructional practices is significant (Harris, 2010).

However, looking at teacher self-efficacy in a general sense may not provide educators and policy makers with the necessary information needed to guide them toward meaningful decision-making (Henson, 2002). Instead, there is a need to focus on specific aspects of teacher self-efficacy, such as teacher technology self-efficacy, because “those individuals with high levels of self-efficacy are most inclined to accept change and choose the best option” (Moersch, 1995, p. 40). Efficacy of experienced teachers is difficult to change (Hoy, 2000). By examining teacher technology self-efficacy specifically, one can narrow the focus of teacher general beliefs of their capabilities in performing any number of tasks to their beliefs about their abilities to perform particular types of tasks. If specific factors affecting teacher levels of technology self-efficacy can be identified, that information can inform educational stakeholders of aspects that can move teachers further along the technology integration continuum.

Additionally, this same information can aid staff developers in creating and providing opportunities for meaningful, purposeful, and relevant development for teachers. Over the last few years, there has been a focus on education and how students and teachers learn in schools. Knight (2007) noted, “with their magnifying glasses focused on instructional practices, many school leaders are discovering that traditional training methods simply do not get the job done” (p. 2). The classroom has changed in many ways over the past 20 years. Technology has become commonplace within the 21st century classroom. Many students are provided with one-to-one devices in the form of iPads or Chromebooks to use in classrooms and, in some situations, to take home for

additional activities (Fox, 2020). Using technology makes sense, because today's students are digital natives (Margaryan et al., 2011) and the majority of these students are adept at using technology. A teacher's effective use of technology made available to them in the classroom has a substantial impact on the effectiveness of the curriculum. Unfortunately, many teachers have expressed that they do not know how to integrate the technology within the classroom (Knight, 2012).

Successful use of technology in the classroom has the potential to engage students, promote conceptual comprehension, and develop spatial intelligence (Hennessy et al., 2006; Way et al., 2009; and Wu & Huang, 2007, as cited in Bell et al., 2013). Technology use is critical to engaging the global society; thus, using technology for learning is essential for the population of students found in schools today (U.S. Department of Education, 2017). As the National Council of Teachers of English (2013) stated, active, successful participants in this modern global community must be proficient with technology tools, use multiple streams of simultaneous information, and think critically about multi-media text while maintaining required ethical standards.

Despite greater access to technology in classrooms and training opportunities for students and teachers, technology remains underutilized in many classrooms (Roblyer & Doering, 2010; U.S. Department of Education, 2017). To teach meaningfully via technological aids requires educators to have tech-inclusive pedagogies and activity approaches (Bull et al., 2005; Brzycki & Dudt, 2005; and Hew & Brush, 2007, as cited in Pamuk, 2012). Factors found to influence teacher use of technology range from the school's physical facilities (Ertmer, 2005) to teacher attitudes towards computer use (Teo, 2009). Self-efficacy has repeatedly been reported as a major component in

understanding the frequency and success with which individuals use technology (Sure, 2009). It can be postulated that teacher beliefs regarding their capacity to work effectively with technology, in general, are directly related to their integration of technology in teaching. Farah (2012) noted that the lack of resources, time, training, and teacher self-efficacy along with certain philosophical beliefs about technology are likely culprits for its infrequent integration into instructional activities. Consequently, the measurement of technology self-efficacy is a useful indicator of the effectiveness of teacher education programs in preparing graduates to use instructional technology (Moore-Hayes, 2011). Cakir (2012) stated, “in order to integrate technology into the school curriculum, it is necessary to identify student needs, existing resources, technology related educational needs and technology design” (p. 273).

A survey by the National Center for Educational Statistics found fewer than half of the 3,000 K-12 teachers who were surveyed reported using technology during instruction (Snyder & Dillow, 2016). If this study is indicative of the general population of educators within the United States, the use of instructional technology in the classroom is in a perilous situation. Instructional technology includes educational tools that are used to improve the delivery of curriculum standards within the classroom.

Conceptual Framework

This work is based upon Bandura’s (1977) theory of self-efficacy. Bandura (1977) noted, “Perceived self-efficacy refers to beliefs in one’s capabilities to organize and execute the courses of action required to given attainments” (p.3).

Self-efficacy is a component of Bandura’s (1977) social cognitive theory, which suggests that human behavior is composed of interacting cognitive, personal, and

environmental events. Bandura (1977) further claimed that self-efficacy is guided by four main influences: (a) mastery experiences, (b) vicarious experiences, (c) social and verbal persuasion, and (d) physiological states.

Mastery experience is viewed as the most crucial factor of the four by Bandura (1977). Mastery is associated with repetitive attempts at a task whereby successful results have been gained through adversity, obstacles, and difficulties. A task that is achieved easily and without effort will result in high self-efficacy, but a future fail may quickly diminish the sense of overall mastery. Self-efficacy may be raised through vicarious experiences; that is, witnessing others who are perceived to be similar to oneself successfully accomplish the task in question. Conversely, if the peer fails at the task despite great effort, the belief that the task can be accomplished may be diminished. “For most activities, there are no absolute measures of adequacy. Therefore, people must appraise their capabilities in relation to the attainment of others” (Bandura, 1977, p. 86). These models provide not only an example that the task can be mastered but a teaching example through observation of how it can be accomplished.

The third source, social persuasion or verbal persuasion, is an acknowledgement from others that one has the capability to accomplish the task. “Most adults can recall something that was said to them (or done to/for them) during their childhood that had a profound effect on their confidence throughout the rest of their life” (Pajares, 2002, p. 1). Further study by Chambliss and Murray (as cited in Bandura, 1994) determined that persuasion has the greatest impact on people who have some underlying belief that they can accomplish the task.

The physiological state of a person (anxiety level, stress, mood, fatigue, health

condition) also influences self-efficacy. Bandura (1994) discussed that people have the ability to read themselves, acknowledging an overall sense of being, determined by their present state of mind. Their level of self-efficacy can be altered to meet that emotional state. “Moreover, when people experience aversive thoughts and fears about their capabilities, those negative affective reactions can themselves trigger the stress and agitation that help ensure the inadequate performance they fear” (Pajares, 2002, p. 119).

Bandura (1977) noted that degrees of self-efficacy expectations vary within three different dimensions: magnitude, generality, and strength. Given different levels of difficulty (magnitude), an individual may have higher self-efficacy for the simpler tasks verses a moderately difficult task. Generality indicates the extent to which perceptions of self-efficacy are limited to particular situations. An individual may believe they are capable of successfully accomplishing an act within a certain setting, while another individual may feel confident that the act can be accomplished regardless of the setting (Compeau & Higgins, 1995). Efficacy expectations also vary in strength – the level of conviction. Weak expectations can easily be hindered by a negative outcome, but those with strong expectations of mastery will tolerate and persevere in the event of a negative outcome (Compeau & Higgins, 1995).

The district in this study has a technology plan for successful implementation of technology into classroom practice. This plan includes five core technology focus dimensions for continued improvement: (a) learners and their environment, (b) professional capacity, (c) instructional capacity, (d) community connections, and (e) support capacity.

The learners and their environment dimension emphasizes helping students use

technology in ways that advance their understanding of the content in the curriculum standards while improving their real-life problem-solving and inquiry skills. The environment should be one of shared learning and should be designed to enhance student academic achievement through scientifically based learning practices and modern technologies.

The professional capacity dimension emphasizes strategies to develop ongoing and sustained professional development programs for all educators—teachers, principals, administrators, and school media center personnel. The instructional capacity dimension specifically targets the development of strategies to integrate technology into curricula and teaching and also explores ways to promote teaching methods that are based on solid and relevant scientific research.

The community connections dimension emphasizes strategies for the development of partnerships and collaborative efforts to support technology-related activities and to maximize community involvement in education. This dimension promotes school and district partnerships with such entities as private schools, higher education institutions, public libraries, museums, nonprofit organizations, adult literacy providers, and business and industry in ways that will increase student achievement and teacher technology proficiency.

The support capacity dimension emphasizes the development of strategies to provide the necessary physical infrastructure and supporting resources such as services, software and other electronically delivered learning materials, and print resources in order to ensure efficient and effective uses of technology.

The district has a desire to have the learning environments tightly intertwined

with technology as a common thread across disciplines. The culture of the district includes the expectation of world-class quality. With world-class quality comes the expectation that modern teaching and learning with technology occurs seamlessly within the district culture. The study used the district technology plan to determine the ways in which the district is using professional development to impact the levels of technology self-efficacy teachers have. The study used Bandura's (1977) influences of self-efficacy to measure what factors affect elementary teacher levels of technology self-efficacy and similarities and differences among technology self-efficacy levels. The study also focused on factors that affect teacher self-efficacy in technology and how the technology is used in the learning environment.

Existing Practices

Digital technology presents new possibilities for living as well as learning inside the classroom (Clark & Mayer, 2016; Kay, 2006; Paus-Hasebrink et al., 2010). New media has a growing impact on most aspects of human endeavor, including that of education where the availability of technology has significantly increased in schools at all levels (Howard, 2013; Tamim et al., 2011). This digital technology revolution in schools, going back to the computer-aided instruction of the early 1980s (Kaousar et al., 2008), started with personal computers, then desktop computers, networks, laptops, interactive whiteboards, and wireless overhead projectors to today's personalized and wearable smart devices with cutting edge virtual worlds in the form of virtual reality and augmented reality capabilities (Gerver, 2018). Technology usage is widespread and technology integration in education has not kept pace (Capo & Ortellana, 2011; Deye, 2015; Gouseti, 2013; Warham et al., 2017).

Research suggests that educators have an impact on how technology is used within the classroom. Teachers may be exposed to technological devices that inform, such as mobile devices, but that does not necessarily translate into technological knowledge needed to perform and instruct using technology as an application or extension to support learning (Clark & Mayer, 2016; Koehler & Mishra, 2009). A number of factors including years of experience, prior knowledge and experience with technology, and professional development opportunities impact how technology is used with the classroom (Ritzhaupt et al., 2012; Ruggiero & Mong, 2015). Teacher lack of basic skills, negative attitudes, and need for professional development is paramount in the conversations addressing technology integration (Coklar & Yurdkul, 2017; Liao et al., 2017).

Many teachers admit that they are not familiar with best practices regarding integrating technology in the classrooms. Schoepp (2005) introduced a study that sought to define the barriers to technology integration. Schoepp observed, “Faculty or teachers in all of the studies did not feel as they were being provided with enough support to become effective technology integrators” (p. 16). Another study found that “even faculty with high levels of proficiency generally identified the same barriers as faculty with low levels of proficiency” (Butler & Selbourn, 2002, p. 23). Ertmer and Ottenbreit-Leftwich (2010) recognized the selected methods of instruction depend on the teachers exposure on prior pedagogical training of 21st century teaching and their repertoire of applicable or related technological skills (for example, being familiar with the device or software applications). A teacher’s experience affects how they use technology within the classroom (Sahin et al., 2016). Insufficient prior experience with technology use, the

number of technology devices a teacher has, inconsistent school level policies, or poor implementation all affect technology integration (Sahin et al., 2016). The issue of how teachers can better equip themselves to be more confident with the integration of technology in the classroom remains.

In March 2020, as a result of the COVID-19 pandemic, teachers were forced to move from face-to-face classroom instruction to designing and developing virtual lessons. Teachers had little experience integrating technology into their face-to-face instruction and were now required to offer virtual instruction and continue to meet the needs of all students in their classroom. The survey data for this study were collected in February 2020; further data collection was halted at the beginning of March due to quick closures. Personal interviews and focus groups were held at the end of March and beginning of April. With the quick turnaround into virtual learning, teachers were seeking support for communicating digitally, integrating technology tools, designing online instruction, assessing student levels of understanding, and serving students equitably through the online environment. Personal interviews and focus group discussion prompted talk of the use of technology prior to the pandemic closure and what was necessary when schools opened back up. The need for additional professional development was prevalent in discussion as participants discussed ways to better understand how to use programs and ways to connect with students and instruct them using online resources.

Statement of the Problem

Ross et al. (2016) recognized that “educational technology is not a homogenous ‘intervention’ but a broad variety of modalities, tools, and strategies for learning” (p. 19).

An emergent problem arises when teachers are not provided regular and relevant opportunities to learn new practices and skills to use and implement technology (An & Reigeluth, 2012; Warham et al., 2017). Having teachers who are confident in their abilities is important for implementing technology-based learning (Lemon & Garvis, 2015).

School districts across the nation are making a substantial investment in technology as well as professional development for technology integration (Lever-Duffy & McDonald, 2011). Increasing teacher self-efficacy calls for appropriate professional development (Hart, 2015) and can be enhanced with sustained collaborative professional development (DeSantis, 2013). In order to aid in the success of student learners, administrators would benefit from offering teachers adequate and effective professional development after thoroughly assessing teacher needs for information about instructional technology use and implementation (Saucier et al., 2014). Most teachers have an awareness of the technologies that are made available to them through their school and district resources; however, many are still hesitant to embrace the benefits that frequent and effective application of technology has to offer. Even when teachers may feel very confident about using new technologies for personal and professional development use, they tend to be less confident in their abilities to integrate the same technology into their lessons or for educational experiences (Sadaf et al., 2016). The research problem is the teacher technology self-efficacy as it applies to classroom technology integration and the role that professional development and learning opportunities play in teacher technology self-efficacy.

Extension of a Study

The framework and research design for this study concerning factors influencing teacher technology self-efficacy are derived from Slutsky's (2016) dissertation, *Factors Influencing Teachers' Technology Self-Efficacy*. I used a form of replication, extending the Slutsky study on teacher technology self-efficacy (Lund Research Ltd., 2012).

Slutsky (2016) explored technology self-efficacy levels of middle and high school teachers in North Carolina. Technology self-efficacy was measured by the Computer Technology Integration Survey (CTIS). Results from the CTIS were quantified to aid in identifying the teachers who became part of the study. A proportional number of teachers were selected from each of the calculated technology self-efficacy quartiles. No other factors were used to help aid the selection of teachers; this included gender, age, and years of experience (Slutsky, 2016). In addition, Slutsky conducted interviews to gather opinions, beliefs, personal feelings, and experiences with regard to classroom technology integration. Focus groups were conducted for a deeper exploration of themes, and document analysis was used to determine what technology self-efficacy factors could be impacted by professional development and learning opportunities (Slutsky, 2016).

The research design for Slutsky's (2016) study was a mixed method case study. A case study is an in-depth analysis of a program involving direct observation of the program being studied and interviews of the persons involved in the activities (Creswell, 2014). Slutsky used both qualitative and quantitative data in the research. A quantitative survey (CTIS) was taken to select participants in the research and determine teacher technology self-efficacy level. The research questions were answered through personal interviews, focus groups, and document analysis.

Replication of a study can be a duplication study, a generalization study, or an extension study (Lund Research Ltd., 2012). To duplicate a study, the researcher uses the same research strategy, design, methodology, and data analysis technique (Lund Research Ltd., 2012). However, when replicating a study, it is appropriate to alter the original study to clarify existing results (Roberts, 2004). A generalization of a study looks at where the findings from the original study may hold across populations, settings, contexts, treatments, and time (Lund Research Ltd., 2012). An extension of a study has the same goals of the original study but has more freedom in terms of research strategies (Lund Research Ltd., 2012). When replicating a study, the researcher may alter variables, research questions, or research instruments (Roberts, 2004).

This study is an extension of Slutsky's (2016) study on teacher technology self-efficacy. This study has both population and context-driven extensions and method and measurement-driven extensions. This study explored a different population by examining technology self-efficacy of elementary teachers instead of middle and high school teachers. The population was all elementary teachers at a district in South Carolina. Slutsky's study examined teachers from one high school and two middle schools in North Carolina. This study analyzed the different setting of a suburban area in South Carolina instead of the rural district in North Carolina in Slutsky's study. The CTIS developed by Wang et al. (2004) was administered to full-time certified staff at 11 elementary schools. The results from the survey modeled the same quantitative method Slutsky used to aid in identifying teachers for selection for the study. Data from the CTIS were not used to directly answer the research questions but instead provided the capacity to identify participants of varying technology self-efficacy levels to continue in the study. Survey

respondents were grouped into three separate levels: low technology self-efficacy, medium technology self-efficacy, and high technology self-efficacy. The method and measurement-driven extension of the original study involved focus groups and interview questions. The focus group and interview questions from Slutsky's study were modified to fit the change in population and setting.

The first justification for extending Slutsky's (2016) study on teacher technology self-efficacy was to test generalizability (Lund Research Ltd., 2012). Extending Slutsky's study helped determine if the results hold across a range of populations. Middle and high school teachers may have a different perspective than elementary teachers. The difference in technology self-efficacy in middle and high school teachers versus elementary teachers tested generalizability.

Another justification for extending Slutsky's (2016) study on teacher technology self-efficacy was to build on previous research (Lund Research Ltd., 2012). Extending Slutsky's study determined if the population is a factor in technology self-efficacy. Slutsky's research looked at three schools in a rural district. This study looked at 11 elementary schools in a suburban district. These different settings can build on previous research.

Another justification for extending Slutsky's (2016) original study was to relay related knowledge that may add greater understanding to the original study (Lund Research Ltd., 2012). Slutsky used a CTIS with middle and high school teachers to determine participants for the study. Although the survey results themselves did not directly answer a research question, the results did provide a framework for identifying participants for the remainder of the study, which aided in answering all three research

questions. This study used this instrument with the intended audience of elementary teachers. This study added information about the characteristics of elementary schools. The generalization of study data, building on previous research, and adding related knowledge are the reasons I chose to replicate by extension Slutsky's original study.

Deficiencies in the Literature

There are a few identified deficiencies in the literature. Education in the 21st century has experienced a seismic pedagogical shift. In part, this shift results from the technological boom that has taken place on a global scale over the last decade. Technology is pervasive in K-12 education with the infusion of hardware, software, and internet connectivity available to both teachers and students (Rideout et al., 2010). Along with this unprecedented infusion of technology, the role of the teacher is shifting from the imparter of knowledge to the facilitator of knowledge (Padmavathi, 2013). Administrators, parents, and students expect teachers to integrate new technologies into lessons to support 21st century students learning and thinking skills such as critical thinking, problem-solving, communication, and collaboration (Partnership for 21st Century Learning [P21], 2019). When a school or district builds on this foundation, combining the entire Framework with the necessary support systems (standards, assessments, curriculum and instruction, professional development, and learning environments), students are more engaged in the learning process and graduate better prepared to thrive in today's global economy (P21, 2019).

Although many of today's students have grown up in a world full of technology as digital natives, many of our country's current teachers have not. The average age of a teacher in the United States in 2017-2018 was 41.6 years old, with only 15.1% of

teachers being less than 30 years old. In 2017-2018, 55.7% of teachers were 30-49 years old, and 11.6% of teachers were 50-54 years old. Approximately 17.6% of teachers were 55 years old or older (Ryberg, 2020). Interviews with Millennial teachers (between the ages of 25 and 30) found that their teacher training in technology did not necessarily match the needs of their first jobs, making it tough for them to “get their bearings” (Karr, 2017, p. 99).

As designers of curriculum, teachers set the stage for technology use. “Teacher attitude is considered as one of the important reasons for avoiding the use of technology in the classroom” (Padmavathi, 2013, p. 5). Research indicates attitudes and barriers to utilizing technology in the classroom may stem from the pedagogies many teachers hold. “Folk pedagogies (the way teachers instruct students is based on how they view children learn) are informed by folk beliefs about the nature of knowledge (folk epistemologies) and how people learn (folk learning theories)” (Belland, 2009, p. 355). Although typically teachers embrace the distinct learning theories they are exposed to in preservice education, often they act based on their folk beliefs (Belland, 2009). These folk pedagogies can act as a barrier to technology integration as educators are often unaware that they act on these beliefs (Belland, 2009; Hammonds et al., 2013).

Purpose of the Study

The purpose of this study was to expand knowledge of teacher technology self-efficacy as it relates to the integration of technology in the classroom. The research examined the current level of self-efficacy of teachers with technology integration, factors affecting technology self-efficacy, and the impact of professional development on teacher levels of technology self-efficacy. This study investigated elementary teacher

self-efficacy beliefs regarding instructional technology. Taking into consideration the immediate and long-term impact of positive teacher self-efficacy related to technology integration, findings will be of interest to current educators and administrators. As the U.S. Department of Education (2017) National Technology Plan stated,

Traditionally, the digital divide referred to the gap between students who had access to the Internet and devices at school and home and those who did not. Significant progress is being made to increase internet access in schools, libraries, and homes across the country. However, a digital use divide separates many students who use technology in ways that transform their learning from those who use the tools to complete the same activities but now with an electronic device (e.g., digital worksheets, online multiple-choice tests). The digital use divide is present in both formal and informal learning settings and across high- and low-poverty schools and communities. (p. 7)

The role of teacher educators in developing teacher technology self-efficacy impacts the future of technology integration in America's classrooms. Many preservice teacher education graduates feel unprepared to use technology to support student learning as they transition to teaching and using technology effectively in the classrooms (U.S. Department of Education, 2017). To successfully integrate technology into education, teachers need to understand the connection between the knowledge of technology practices and their own efficacy in using them.

Kopcha (2012) completed a case study of teacher perceptions of barriers to technology integration revealing five factors that impede teachers from utilizing technology effectively in their classrooms. Table 1 summarizes those findings.

Table 1

Kopcha's (2012) Barriers to Integrating Technology into Instruction

Barrier	Instructional implications
Access	Lack of access because it does not work properly.
Vision	Administration does not have a strong vision for technology integration making teachers less likely to integrate technology.
Beliefs	Teacher beliefs about the usefulness and difficulty of technology integration influence the frequency in which they practice technology integration.
Time	Learning to plan and implement technology instructionally takes a large amount of time.
Professional development	Inadequate professional development is a barrier to technology integration when it fails to provide teachers with authentic experience for planning and implementing instructional technologies.

Kopcha (2012) noted that there is a “clear connection between the degree to which teachers experience these barriers and their decision to use technology for instruction” (p. 110) and that professional development, administrative support, and teacher beliefs impact teacher technology efficacy and the frequency with which they integrate technology into instructional classroom experiences.

Setting

The participants for this study are full-time, certified teachers from 11 elementary schools within a single school district located in a suburban area of South Carolina. Table 2 shows the demographic report for the 2019-2020 school year.

Table 2*A5 Elementary School Demographic Report for 2019-2020*

School	White	Black	Hispanic	Other	SpED	GT	ESOL	Technology instructional coach	Total students
1	37%	46%	9%	8%	16%	4%	6%	No	565
2	53%	27%	7%	13%	12%	3%	5%	No	684
3	65%	16%	6%	13%	13%	10%	5%	No	561
4	21%	46%	23%	10%	11%	0%	11%	No	447
5	66%	21%	5%	8%	20%	3%	5%	Yes	635
6	72%	1%	6%	10%	21%	8%	8%	Yes	751
7	18%	69%	5%	9%	15%	0%	2%	No	508
8	36%	43%	12%	9%	16%	2%	9%	No	496
9	67%	16%	6%	10%	13%	8%	6%	Yes	588
10	23%	50%	19%	8%	19%	0%	15%	No	344
11	37%	42%	9%	12%	12%	1%	5%	No	502

Each elementary school employs approximately 45 certified teachers. There are three schools that have full-time instructional technology specialists, while the other schools have weekly face-to-face interaction with an instructional technology specialist who works with teachers to design lessons that are engaging and promote 21st century skills. District administration and school administrators from each school gave permission for the study to take place.

Research Questions

The following research questions were based on Slutsky's (2016) study:

1. What factors affect elementary teacher levels of technology self-efficacy?
2. What similarities and differences exist between and among elementary teachers of varying technology self-efficacy levels?
3. In what ways could identified factors affecting elementary teacher levels of technology self-efficacy be impacted by professional learning opportunities?

The research will address what affects teacher self-efficacy and will help inform educational institutions of how to target resources in a purposeful way as well as identify ways to create and deliver future professional development opportunities that will enhance technology use in the classroom. An explanatory sequential mixed methods design will be used involving the collection of quantitative data and qualitative data.

Definitions of Major Concepts and Terms

The following terms are used throughout the research and are defined for the purpose of the study.

Technology Integration

Curriculum integration with the use of technology involves using technology as a tool to enhance learning in a content area. Effective integration of technology involves students using tools to help them obtain information, synthesize, and present information successfully. The technology becomes an integral part of how the classroom functions.

One-to-One

A one-to-one (1:1) program refers to students in a school who are provided with their own Chromebook. One-to-one refers to the rationing of at least one device to each student (Abbott, 2013).

Instructional Technology

Instructional technology is a combination of technological, pedagogical, and content knowledge (Koehler, 2013). The essential features are the use of appropriate technology in a particular content area as part of a pedagogical strategy and within given educational content to develop student knowledge of a particular topic or to meet an educational objective or student need (Cox & Graham, 2009).

Technology Self-Efficacy

One's belief about one's ability to succeed at a specific task that involves the use of technological tools (Harris, 2010).

Technology Coach

Certified teachers responsible for assisting teachers in the effective integration of technology into the classroom. They help teachers in modeling, designing, and carrying out lessons that use technology to promote 21st century skills among students.

Limitations and Delimitations

Delimitations are the forces a researcher can control defining the parameters of the study. A delimitation of this study was the replication of a previous study and my choice to focus on elementary school teachers as participants within one school district and modify the interview and focus group questions. There was also the delimitation of choice on the survey used to determine the levels of technology integration used by teachers.

Limitations are forces the researcher cannot control. Limitations place restrictions on the methodology. It is necessary for me to recognize that the research results in this study only apply to one district of elementary teachers in South Carolina. Another limitation includes some of the elementary schools having full access to a Digital Integration Specialist, while other sites have limited access based on availability. The COVID-19 pandemic was a limitation that was unforeseen by educators and researchers. Data were collected during the pandemic causing an impact to teacher levels of self-efficacy due to COVID-19. Teacher stress levels were maximized and understanding of technology was a question many of them had. No generalizations were made about the

wider educational community.

Summary

In education, there has been a tendency to only look at the technology and not how it is used; however, merely introducing technology to the educational process is not enough. Twenty-first century skills and technology integration go hand-in-hand, since our students live in a world that is full of technology and media (P21, 2019). Smith-Budhai and McLaughlin Taddei (2015) noted, “technology creates environments where students can develop critical thinking, communication, collaboration, and creativity skills” (p. 1). Technology has allowed for students to enhance problem-based inquiry and meet the needs of diverse learners (Smith-Budhai & McLaughlin Taddei, 2015). “All can agree that the core challenge is to expand the use of technology to support teaching and learning opportunities” (McLeod et al., 2012, p. 184). Students have access to multitudes of technology, and teachers need to be prepared for the pace at which technology is growing and students are adapting. Teachers have to determine how they can teach existing content in a new way that integrates the learning of the current and future content. This study was designed to answer questions about factors affecting teacher levels of technology self-efficacy, the similarities and differences that exist between and among teachers of varying technology self-efficacy levels, and how identified factors are impacted by professional learning experiences.

In Chapter 2, a review of related literature is presented in the area of technology use and its importance in schools. Chapter 3 outlines the methodology used in the research process. Chapter 4 presents the results of the CTIS, personal interviews, and focus groups. Chapter 5 offers discussion of how relevant research connects to results and

compares the results of this study to Slutsky's (2016) research.

Chapter 2: Literature Review

Introduction

Technology now plays a critical role in today's society and is considered to be an essential tool used in the workforce. As a result of technology's influence throughout the world, educators around the globe have taken notice of the need to equip young people with 21st century technology skills. Educators, educational leaders, and policy makers have led reform efforts to target this need and develop resources that will help students be competitive in the global market. An essential resource that educational leaders and policy makers focus a good deal of their time, energy, and funds toward is teachers. Recognizing that teachers play a crucial role in developing and enhancing student skills, it becomes vital for teachers to be equipped with the 21st century technology skills as well. However, if teachers lack the confidence to carry out instructions that target such skills, they will not be very likely to use such skills in their classroom (Hyndman, 2018).

Educators have made efforts to keep up with changing technology, but there has not been much done for incorporating technology effectively as well as transforming the quality of instruction within the classroom (Franklin, 2008). Districts, administration, and schools need to make technology integration a priority. To properly integrate technology, educators need to have an effective support system, proper training, and become equipped with 21st century technology skills.

This literature review presents research in five major areas: 21st century learning skills, technology as an instructional tool, elementary learners and technology, teacher self-efficacy, and technology self-efficacy as a factor influencing technology use; and methods for improving teacher confidence with technology.

21st Century Learners and Skills

Technology is changing the face of the world, and being technologically literate is increasingly important. To keep students competitive in the global market, educators have the responsibility to equip students with the tools to be successful in the technological world. Students who want to be successful in the world must learn and become comfortable with a variety of new media, and schools must take steps to help students acquire these necessary technological skills (Mullen & Wedwick, 2008).

According to Johnson (2009), the 21st Century Skills Movement and its Framework for 21st Century Learning identify four components that describe the skills and knowledge various stakeholders believe to be essential, one of which involves “information, media, and technology skills” (p. 11). In efforts to equip students with 21st century skills, education policy makers must be very deliberate in their focus on training teachers to be able to teach in ways that promote the development of such skills (Rotherham & Willingham, 2009). According to Means (2001), to reap the benefits of educational technology, efforts must be made in the areas of teacher preparation and professional development. To target teacher preparation and professional development while at the same time being mindful of recent budgetary challenges facing the nation, it is crucial that educational researchers identify those factors that are highly influential in developing teacher confidence and capacity to use technology effectively.

Technology as an Instructional Tool

While reviewing research on the impact of technology on learning effectiveness of elementary students, it was found that the majority of research considers multiple grade levels, but there is a lack of focus on elementary students. Technology is a popular

part of elementary schools. If technology is integrated into the pedagogy of elementary students, it has the power to engage the students and therefore lead to higher learning effectiveness.

For a long time now, technology has been a part of the day-to-day routines of teachers. Many schools now use technology to store and track grades, take attendance, and communicate with colleagues and parents. In recent years, however, technology has played a more active role in schools, as it has been used as a form of instruction in teacher classrooms. More than ever before, teachers are using computers for not only administrative tasks but also instructional purposes. Technology integration and implementation in schools through the blended learning approach support this shift in learning and teaching (Tucker, 2017). Teaching that uses advances in technology allows teachers to free students from a one-size-fits-all instruction mode and enables them to better explore more meaningful cross-curricular pathways (Rebora, 2017).

Technology is an instructional tool when it is used to engage students and lead them toward constructing new knowledge and skills. Technology creates various learning opportunities because of the access to the global world it provides and the interactive tools it possesses. As a result, there are limitless opportunities to learn and share ideas to create more effective learning experiences.

Elementary Learners and Technology

Educational technology has a place in all grade levels, including the lower grades. For several years, the U.S. Department of Education (2016) has provided official guidelines on the use of technology with young children. The department sets out four guiding principles for using technology with early learners:

1. Technology—when used appropriately—can be a tool for learning.
2. Technology should be used to increase access to learning opportunities for all learning.
3. Technology may be used to strengthen relationships among parents, families, early educators and young children.
4. Technology is more effective for learning when adults and peers interact or co-view with young children. (U.S. Department of Education, 2016, p. 7)

Engaging elementary students in meaningful learning is not an easy task. Both teaching and learning have evolved in the 21st century. With a wealth of information as close as the nearest device, children need different skills than their parents did. By appealing to their curiosity and giving them the proper tools, teachers can empower students to be engaged and self-directed learners (Levin & Engel, 2016). Since teaching and learning are dynamic endeavors, teachers must be open-minded and willing to learn themselves. They need to be tech savvy and embrace the use of learning technologies in the classroom. Teachers must also have an understanding of child development and exemplify a growth mindset.

Mixing technology with traditional classroom instruction, or blended learning, is moving from high schools and middle schools to the earlier grades, even reaching some 4-year-olds in transitional kindergarten (Epstein, 2018; Frey, 2015; Hui, 2019; Moll, 2019). Technology is something that most, if not all kids enjoy; it can easily boost and engage students through use in the classroom. Elementary students may easily become bored with traditional lectures, textbooks, and written assignments since they result in a more passive learning environment. Elementary technology use not only helps young

students learn the skills required to operate the newest devices and latest software but also allows them to research and solve problems in a collaborative and cooperative manner with their peers. Additionally, teachers are able to expand on and reinforce subject matter through the use of technology, something that was not possible a short time ago (Riskey, 2018). In a world where advances in technology occur at an almost astounding rate and most careers have at least some technological aspect, if kids are comfortable with technology at a young age, it may be easier for them to keep up with the changes and land a job in the future.

Teacher Self-Efficacy

Research studies have established the importance of a positive sense of efficacy on teacher effectiveness (Knoblauch & Hoy, 2008; Putman, 2012). Self-efficacy is rooted in Bandura's (1977) social cognitive theory. This theory highlights the perspective that people are change agents. Bandura (1977) defined efficacy as intellectual activity by which one develops one's beliefs about their ability to achieve a certain level of accomplishment. Research supports the theory that teachers with a high sense of self-efficacy and belief in their ability to positively impact student learning are more likely to participate in professional development (Gersten et al., 2000) that often leads to implementation of innovative teaching strategies (Sparks, 1988) and ultimately have a stronger academic focus in their teaching (Dembo & Gibson, 1985). A strong sense of teaching efficacy also often results in higher motivation, more effort, determination, and resilience (Tschannen-Moran et al., 1998).

Low levels of efficacy in teachers result in negative behaviors such as responding with criticism and giving up on academically struggling students. In sum, a teacher's self-

efficacy has a strong connection to their overall impact and level of effectiveness (Tschannen-Moran et al., 1998, as cited in Palmer, 2011). Self-efficacy regarding computer use and technology integration has been of particular interest recently.

Technology Self-Efficacy as a Factor Influencing Technology Use

Teacher attitudes toward technology play a significant role in the integration of technology in their classrooms. Ultimately, teachers decide the level of technology integration in their classrooms (Jimoyiannis & Komis, 2006). Given the enormity of responsibility experienced by most new teachers, Clausen (2007) found that often, new teachers have difficulty integrating technology into their teaching during the induction period. As leaders in education push using new technologies in the teaching process, teachers have reported feeling inadequate in their ability to teach via emerging technologies (Martin et al., 2014). Research reports that efficacy is situated within context; therefore, examining specific curriculum areas such as technology may help identify teachers who will be more likely to implement technology, as higher levels of efficacy generally result in higher levels of implementation (Epstein, 2018; Henson, 2002; Hui, 2019; Moersch, 1995). Teachers with a high sense of self-efficacy “create a dynamic, student-centered learning environment in which students take ownership of their learning” (Swan et al., 2011, p. 130). This approach to teaching allows for more student involvement. Lower technology self-efficacy can directly impact both teacher satisfaction as well as student achievement (Skaalvik & Skaalvik, 2014).

Technology in Schools

Technologies like Web 2.0 tools, iPads, Chromebooks, and mobile devices; and new media, such as the internet, smartphones, virtual worlds, and computer animation,

are speedily changing both how students learn inside and outside of schools as well as how they communicate and interact with the world (Sadaf et al., 2016). Students are expected to harness the power of technology for continuous learning and leverage the benefits of collaboration for meaningful connected interaction. In response to demands supporting standardized testing and 21st century learning, teachers today are asked to design personalized, customized, and differentiated learning experiences for students compared to the outdated traditional teacher-led approach of a one-size-fits-all educational model (An & Reigeluth, 2012; Deye, 2015; Tomlinson, 2017).

Technology and Education

Technology has come to play an essential role in education today. As a result of the growing digital world, technology is almost everywhere and essential to almost everyone. Despite advances in teacher preparation programs, there are still difficulties with aligning educational technology theory and practice to support teacher confidence to use and teach with educational technologies (Sutton, 2011; Tondeur et al., 2012). Few research reports of teacher preparation programs combine both 1:1 device initiatives and classes within a working school, with all of the possibilities for interaction with K-12 students that these provide (Ally et al., 2014; Benedict et al., 2016; Nguyen, 2015). It has become the charge of educators to build a technology skill set so students can compete in and contribute to the global society they will soon enter.

Educational reform targets the use of instructional technology to support active student learning; as a result, a significant amount of money has been invested in supplying schools with technology resources (Palak & Walls, 2009). Technology-based learning is believed to be essential to improving student performance (U.S. Department

of Education, 2010). The U.S. Department of Education (2017) noted,

By understanding how to help students access online information, engage in simulations of real-world events, and use technology to document their world, educators can help their students examine problems and think deeply about their learning. Teachers also can take advantage of these spaces for themselves as they navigate new understandings of teaching that move beyond a focus on what they teach to a much broader menu of how students can learn and show what they know. (p. 29)

There is a challenge to leverage what students already know about technology and help them to learn and create meaningful and engaging experiences. According to the U.S. Department of Education's (2017) National Technology Plan,

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. In addition, the roles of PK–12 classroom teachers and postsecondary instructors, librarians, families, and learners all will need to shift as technology enables new types of learning experiences. (p. 5)

Technology must become an integral and essential component in schools used by all people of the community. The United States needs to find ways to integrate technology successfully while maintaining financial stability.

In efforts to assist in reforming education, P21 (2019) is a national organization that advocates for 21st century readiness for every student. P21 helps to provide tools and

resources that can aid the U.S. education system in keeping up with their global counterparts. P21 operates from a framework that presents a holistic view of 21st century teaching combined with innovative support systems to help students master the skills required of them in the 21st century. The student outcomes refer to skills, knowledge, and expertise students should master; and they include life and career skills, learning and innovation skills, information, media, and technology skills as well as core subjects and 21st century themes. Additionally, the support systems involved in the framework consist of standards and assessments, curriculum and instruction, professional development, and learning environments (P21, 2019). Using the framework as a guide, P21 hopes to realize its mission and advocates for student successful development and attainment of 21st century skills to make a positive impact on the global society.

In 2017, the International Society for Technology in Education (ISTE) developed a revised set of seven student standards to help prepare students to thrive in a constantly evolving technological landscape. The standards are designed to empower student voice and ensure that learning is a student-driven process.

The ISTE (2017) standards for students include

1. **Empowered Learner:** Students leverage technology to take an active role in choosing, achieving, and demonstrating competency in their learning goals, informed by the learning sciences.
2. **Digital Citizen:** Students recognize the rights, responsibilities, and opportunities of living, learning, and working in an interconnected digital world; and they act and model in ways that are safe, legal, and ethical.
3. **Knowledge Constructor:** Students critically curate a variety of resources using

digital tools to construct knowledge, produce creative artifacts, and make meaningful learning experiences for themselves and others.

4. Innovative Designer: Students use a variety of technologies within a design process to identify and solve problems by creating new, useful, or imaginative solutions.
5. Computational Thinker: Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.
6. Creative Communicator: Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats, and digital media appropriate to their goals.
7. Global Collaborator: Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally.

In order to guide students toward the path to successfully meet the criteria of these standards, ISTE (2017) also developed educator standards. The educator standards provide a road map to help students become empowered learners. The educator standards focus on the (a) learner, (b) leader, (c) citizen, (d) collaborator, (e) designer, (f) facilitator, and (g) analyst (ISTE, 2017). Using these standards to guide technology integration into classroom instruction will allow teachers to deepen their own professional practice, promote further collaboration with peers, challenge thoughts of traditional approaches, and prepare students to drive their own learning (ISTE, 2017).

Technology in South Carolina Schools

South Carolina has worked to ensure the state's educational technology plan aligns with federal guidelines surrounding education. South Carolina follows the six principles of the National Education Technology Plan, which are as follows:

1. **Learning: Engage and Empower**—All learners will have engaging and empowering experiences both in and out of school that prepare them to be active, creative, knowledgeable, and ethical participants in a globally networked society.
2. **Assessment: Measure What Matters**—The education system at all levels will utilize the power of technology to measure what matters and use assessment data for continuous improvement.
3. **Teaching: Prepare and Connect**—Professional educators will be supported individually and in teams by technology that connects them to data, content, resources, expertise, and learning experiences that can empower and inspire them to provide more effective teaching for all learners.
4. **Infrastructure: Access and Enable**—All students and educators will have access to a comprehensive infrastructure for learning when and where they need it.
5. **Productivity: Redesign and Transform**—The education system at all levels will redesign processes and structures to take advantage of the power of technology to improve learning outcomes while making more efficient use of time, money, and staff.
6. **Research and Develop: Innovate and Scale**—The education system will use a combination of continuing grants, effective practices, and innovations from

areas outside education as well as active participation of experts from fields such as business and entertainment technology to find, develop, and implement effective improvements to education efforts which can be maintained and supported on a national scale.

The school district in which this study took place has a technology plan in place that aligns with the state principles. The vision of the school district as noted in the technology plan noted,

The instructional technology in the district applies best practices to ensure high quality learning opportunities that improve student engagement and academic achievement through effective use of technologies across the curriculum. The district will facilitate the opportunity for all students to become well informed, imaginative and effective decision makers, capable of working both independently and collaboratively to create workable solutions to complex problems resembling those they will encounter during the Information Age. We will encourage them to act in a caring, compassionate and empathetic manner. Toward those ends, we will stress activities which challenge students to do their own thinking and learning.

The five technology dimensions of the district technology plan include (a) Learners and Their Environment, (b) Professional Capacity, (c) Instructional Capacity, (d) Community Connections, and (e) Support Capacity. Each goal is for educators to integrate and use technology for purposes of enhancing the educational experiences of students. However, without identifying factors that play a role in building teacher confidence in their capacity to use technology effectively, the goals set forth by the state

cannot be realized (U.S. Department of Education, 2017).

Critique of Technology in Elementary Classrooms

In a study through Gallup (2018), teachers were surveyed on their feelings of the effects of technology on student education, physical health, and mental health. Figure 1 shows the results of survey. The majority of teachers felt that technology has a harmful effect on student physical and mental health but is mostly helpful versus harmful on their education. Providing proper training for teachers on how to implement technology into their classrooms can be effective in increasing technology self-efficacy among teachers as well as being helpful in instructional use.

Figure 1

Teacher Views on the Effects of the Use of Digital Devices by Students

Teachers' Views on the Effects of the Use of Digital Devices by Students			
Please think about the effects of digital devices on students. Do you believe that students' use of digital devices such as smartphones, tablets and computers has helpful or harmful effects in the following areas?			
	Mostly helpful	Neither helpful nor harmful	Mostly harmful
	%	%	%
Effects of digital devices on students' education	42	30	28
Effects of digital devices on students' physical health	4	42	55
Effects of digital devices on students' mental health	4	27	69
U.S. teacher poll			
GALLUP PANEL, MARCH 5-12, 2018			

Note: Effects of digital devices on students (Gallup, 2018).

It is important to be mindful of how technology is implemented in any classroom for any grade level. Silagadze (2012) noted, “we need to be careful to introduce technology in thoughtful ways or else we will be left with another generation of teachers who see technology as nothing but overpriced distractions rather than useful teaching tools” (para. 8). In an article on turning screen time into learning time, Simon (2019)

noted, “screen time is like food; some of it’s bad for you and some of it’s good for you ... it’s important to understand the role we want technology to play in our kids’ lives” (para. 1).

ISTE Standards in Education

The ISTE (2017) standards for students offer guidelines on how students should relate to digital media through being empowered learners, digital citizens, knowledge constructors, innovative designers, computational thinkers, creative communicators, and global collaborators. It is not necessarily about the screen, but more about what you do with screen time that matters. Having strong oversight and involvement from parents, teachers, and adults allows for children to be successful. There needs to be opportunity for discovering how rich and diverse the digital age can be. In order to create opportunities for deeper learning there needs to be rich content full of valid sources of information and discussion. This allows for students to be knowledge constructors. Students can be creative communicators and innovative designers through proper creation tools.

Methods for Improving Teacher Confidence with Technology

Teacher access to computers and technology training has increased tremendously in schools, but that alone has not helped technology make the leap to lead powerful student-centered instruction. Teachers play a crucial role in leading instruction and enhancing student skills. It is essential that teachers are furnished with the technology and 21st century skills to carry out their jobs, but we must also instill confidence within them to be a change agent.

Teachers need to see the need for technology integration. Better student results

require better teaching, and integrating technology into the curriculum can provide a tool to improve student engagement and understanding (Carver, 2016). Teachers who choose to use technology as a problem-solving tool change the way they teach from a behavioral approach to adding an additional tool to have a more constructivist approach to learning. Technology is instrumental to successful project-based learning of content. Schools must refrain from using technology for technology's sake and develop a vision of how technology can improve teaching and learning (Gahala, 2001). Teachers must see the need for technology integration and not technology as disconnected from the curriculum. Morehead and LaBeau (2005) noted, "A disconnect means that teachers see no relevance between what the students need to know and what they can construct, find or ponder with computer technology" (p. 121).

Teachers must accept the changing role of an educator. Teachers must accept technology as an integral part of educating the students of the 21st century (Morehead & LaBeau, 2005). Integrating technology no longer means dropping off a class of students at the computer lab to learn how to type. Technology can flip the general classroom roles. Students gain responsibility for their learning outcomes and desires. Teachers become more of a guide and facilitator. Technology is the main tool that assists in this transformation into student-centered learning and, when used effectively, improving student performance on achievement tests (Kulik, 2003; Wenglinsky, 2006).

Technology integration in classroom instruction requires the acceptance and acknowledgement of its benefits from educational leaders and teachers. The constructivist approach to integrating technology in the classroom suggests that teachers must possess a "sensitivity to all aspects of a situation in which learners structure their

experiences” (Zhang, 2019, p. 378).

A powerful strategy to help teachers gain self-efficacy to integrate technology into their classrooms is to provide opportunities for them to observe, collaborate, reflect, and share with their peers (Ertmer et al., 2006; Mumtaz, 2000). Often, teachers have not seen proper examples of technology integration; but allowing them to observe others can give them the needed knowledge about what successful technology integration looks like in the classroom (Ertmer & Ottenbreit-Leftwich, 2010). Technology practices are more effective if teachers have had the opportunity to observe and interact with positive role models.

Summary

Although self-efficacy is a factor that is known to play an important role in one’s decisions to use technology or rather adopt any of a variety of behaviors, there still remains a need to identify factors that affect teacher technology self-efficacy so that information can be used to inform leaders everywhere as to how best to use their resources to develop the best product possible, in this case, human capital. Measuring teacher technology self-efficacy has been done, but factors influencing teacher levels of technology self-efficacy, especially at the elementary level, remain to be examined. By identifying factors that play a role in developing teacher technology self-efficacy, educational leaders can focus their efforts in a purposeful and meaningful way so as to better equip teachers with the skills and tools necessary to build the 21st century skills of students, starting with those in elementary classrooms.

As the COVID-19 crisis pulled the plug on the structure inside the classroom, educators had to shift how teaching and learning happens. The pandemic put a spotlight

on the lack of readiness among districts to facilitate 21st century learning practices. The models of ISTE and the Framework for 21st Century Learning have identified key practices for successful online learning and support of teachers and students (ISTE, 2020).

In Chapter 3, the methodology of the research study is presented, including selection of participants, demographic data, the instruments utilized, and procedures that were used to conduct the study.

Chapter 3: Methodology

Introduction

This chapter provides an overview of the methods that were utilized in the case study to identify and examine factors influencing teacher technology self-efficacy. This study is a replication by extension of Slutsky's (2016) dissertation, *Factors Influencing Teachers' Technology Self-Efficacy*. Slutsky's study was a mixed methods case study. I replicated, with extension, Slutsky's methods utilizing a differing context including a different grade level span, different state, and a suburban rather than a rural context. Case study research is done when the study is a contemporary phenomenon, the researcher has little control over behavioral events, and the main research questions are how or why (Yin, 2014). I copied the original work in every way possible while using population and context-driven extensions and methods and measurement-driven extensions (Lund Research Ltd., 2012). The population extension involved using elementary teachers instead of Slutsky's middle and high school teachers. The method and measurement extension included minor changes in the focus groups and interview questions formatted for elementary teachers instead of middle and high school teachers. This methodology was used to address the following research questions:

1. What factors affect elementary teacher levels of technology self-efficacy?
2. What similarities and differences exist between and among elementary teachers of varying technology self-efficacy levels?
3. In what ways could identified factors affecting elementary teacher levels of technology self-efficacy be impacted by professional learning opportunities?

This chapter outlines the research design of the study. The chapter presents the

participants, research design, research questions, instruments, procedures, data collection, data analysis, and survey results.

Research Design

A case study was used for this study. According to Ary et al. (2006), “case studies provide an intensive description and analysis of a phenomenon or social unit such as an individual, group, institution, or community” (p. 456). A multi-site, multi-subject case study design was appropriate for this study because the goal was to seek a deeper understanding of teacher levels of technology self-efficacy. Specific individual factors affecting teacher levels of technology self-efficacy were of primary interest.

Participants

The participants in this case study were full-time, certified teachers from elementary schools in a single school district in South Carolina. There were 275 teachers surveyed from the elementary schools within the district. District administration and school administrators from each school gave permission for the study to take place.

Setting

The setting in this case study was a large, suburban public school district in South Carolina. This setting was chosen out of convenience because the candidate had access to the participants as a result of current employment in the district. The school district had extensive technological resources available to teachers, and individual schools within the district had the freedom to provide teachers with various types of professional development opportunities on technology. The school district in which this study was situated also had a comprehensive technology plan in place. This plan was fully described in Chapter 2. Elementary schools in the district served K-5 students. Local school

principals had a great deal of autonomy concerning local school staffing and local school initiatives as long as they served to reinforce the district's mission and vision.

In March 2020, the COVID-19 pandemic forced teachers from their face-to-face classroom setting to teaching virtually. During the time of data collection, teachers were overwhelmed with providing lesson delivery with live instruction via online tools. Teachers were expected to provide parents with an understanding of how virtual learning would take place as well as provide support for technology problems that arose during the school closure. The data collection for this study began in February 2020 through collection of survey results. Interview and focus group meetings were planned for the beginning of March 2020. Due to school closures and the COVID-19 pandemic, interviews and focus groups were moved to the end of March and beginning of April. The immediate school closure affected how teachers used technology in instruction and resulted in discussion of how to better prepare for the future with using technology in the classroom.

Instruments

Survey

The survey selected for use in this study was the CTIS developed by Wang et al. (2004). The survey was a necessary first step in identifying factors influencing teacher technology self-efficacy because the results provided information on the current self-efficacy levels of participants, making it possible to identify teachers at varying levels of self-efficacy. Permission to use the survey is available in Appendix A. The survey is available in Appendix B. The instrument was composed of 21 statements regarding participant confidence for technology use in the classroom. Participants were asked to

state their agreement with statements on a 5-point Likert scale ranging from 1 (SD, strongly disagree) to 5 (SA, strongly agree). All 21 items positively and consistently begin with the initial stem of “I feel confident that...” (Wang et al., 2004). The CTIS was initially developed to be used as a pre and postsurvey measure and was used in a study to measure preservice teacher self-efficacy beliefs for technology integration (Wang et al., 2004). In order to conduct the case study, the CTIS (Wang et al., 2004) was used first. The survey results were quantified and subsequently aided in identifying the subjects who became a part of the study through participants answering if they would be interested in participating in personal interviews or focus group discussions.

Interviews

Interviews were used in this case study to gather data on participant opinions, beliefs, and feelings concerning their level of technology self-efficacy. In qualitative research, interviews are used to dive deeper into topics and allow the researcher to ask people to explain their answers, give examples, and describe their experiences (Rubin & Rubin, 2005). Self-efficacy is grounded in social cognitive theory; therefore, it was essential for me to understand participant thoughts toward their capabilities with technology. The interview protocol is available in Appendix C. The interviews consisted of 10 items (Appendix C) that were adapted to meet the needs of the participants with respect to how they used technology in an elementary setting (Slutsky, 2016). According to research (Bandura, 1994; Locke, 2000; Martin, 2004), personal, environmental, and behavioral factors affect efficacy. Several of the interview questions addressed various personal, environmental, and behavioral aspects related to the participants. Other questions addressed participant prior experience with technology. These interview

questions were peer-reviewed by Slutsky's (2016) dissertation committee and used in his original study. The information gathered in interviews helped with data for all three research questions. Table 3 shows each of the main interview questions as well as to which aspect or source of efficacy it is connected.

Table 3

Interview Questions as Related to Sources of Efficacy

Interview questions	Aspect of efficacy
1. How long and in what roles have you been in education?	Personal
2. Do you enjoy using technology outside of education?	Mastery/vicarious learning experience
3. Tell me about your participation in professional development targeting the use of instructional technology. What were the strengths of that professional development? How could it have been improved?	Mastery/vicarious learning experience
4. Tell me about the influence other teachers or staff members (may be individuals or students) have on your technology practices.	Personal
5. Tell me about the influence of experience outside of the school setting on your use of instructional technology.	Mastery/vicarious learning experience
6. Do you consider yourself an innovative teacher? Why or why not?	Personal
7. What barriers have you experienced in your attempts to use technology in your classroom?	Personal
8. What supports have you experienced in your attempts to use technology in your classroom?	Personal
9. How often do you experiment or take the time to learn a new technology? In what way?	Personal
10. What more can you tell me about your experiences with instructional technology in your classroom? In education in general?	Behavioral

Focus Groups

Focus groups were formed as a way for me to better understand the emerging themes identified from interviews. The purpose of focus groups is to help participants clarify and further explore beliefs. According to Hatch (2002), “focus group interviews are often used to supplement other qualitative data” (p. 24). Allowing others to express their feelings allowed me to understand the group perspectives as well as similarities and differences that exist among teachers through sharing their beliefs, opinions, and feelings. Focus group questions are available in Appendix D.

Upon completion of personal interviews, focus groups convened. The groups were built based on teachers who agreed to participate in the interview and focus group or focus group only. Focus group participants were grouped based on their technology self-efficacy score from the CTIS. The focus groups were composed of teachers from each of the technology self-efficacy ranges to allow for discussion from all levels.

Document Analysis

Document analysis allowed me to understand better the factors that play a role in participant levels of technology self-efficacy. Professional development materials were collected from each school and analyzed to determine the characteristics of the technology trainings that were offered at each location. The document analysis helped to answer the third research question.

Procedures

Before any data collection began, approval was granted from the Gardner-Webb University Institutional Review Board as well as the local school district. Additionally, permission was granted to use the CTIS (Wang et al., 2004; Appendix A) to collect initial

data which helped to identify participants for the case study. The CTIS was sent via the school district's email system to all full-time certified elementary teachers' school email addresses. I attended a faculty meeting at each school to give an overview and purpose of the study and survey before the email was sent out. Teachers were notified of their rights not to participate in the survey. Teachers were asked to attach their name to the survey to aid in contacting them should they wish to be invited to participate. Data from the survey were not used to answer the research questions but instead provided information to identify participants to continue in the study.

Similar to Slutsky's (2016) research, valid surveys were quantified into the interquartile range and categorized into three separate levels: low technology self-efficacy, medium technology self-efficacy, and high technology self-efficacy. The levels of technology self-efficacy were determined by the total score on the individual teacher surveys. For purposes of quantifying survey results, each of the 21 survey items (Appendix B) had five choices using a Likert scale, which were assigned a point value ranging from 1 to 5. The following point values were assigned to each descriptor: 1=strongly disagree; 2=disagree; 3=neutral; 4=agree; 5=strongly agree. Once teachers completed the survey, the interquartile range was calculated. Participant survey results were quantified based on the aforementioned assigned point values: low technology self-efficacy, with a point range of 22-72; medium technology self-efficacy, with a point range of 73-89; and high technology self-efficacy with a point range of 90-105.

Twelve interviews were conducted with teachers within the 11 elementary schools within the district. The quartile results from the CTIS were used to create a list of potential interview participants. Due to the small number of survey responses, all teachers

who noted an interest in interviewing were invited to participate. Quartile ranges were noted for each participant. An even number of high and middle quartile teachers expressed interest in interviewing, while only two teachers from the lower quartile showed interest in being interviewed. Originally, 19 participants showed interest in participating in interviews; but due to closures because of COVID-19 when interviews were being scheduled, seven individuals declined the opportunity to interview. Interviews were held online, because of quarantine circumstances surrounding COVID-19, at a time that was convenient for participants.

Face-to-face interviews were conducted online through a video conference site. Interviews consisted of a set of structured questions but allowed room for open-ended questions and discussion in order to provide the participants freedom to explain their personal experiences with integration of educational technology, self-efficacy, and professional learning opportunities. A total of 10 questions (Appendix C) were asked to help answer the research questions. The questions focused on one of four of Bandura's (1977) aspects of efficacy. There were three questions that focused on the personal aspect of efficacy, three questions that looked at the mastery/vicarious learning experiences of efficacy, three questions on the environmental aspects of efficacy, and one question on the behavioral aspects of efficacy. Written notes were taken, and audio from all interviews was digitally recorded and later transcribed.

After one-on-one interviews were conducted, two separate focus group discussions were held in order to bring participants from mixed quartile groups and different schools together to share their thoughts and beliefs about technology. Originally, 14 teachers agreed to participate in focus group discussions. Following school

closure because of COVID-19, 11 teachers volunteered to participate in focus groups. The change in number of participants changed the focus groups from three to two to allow for a more diverse group of schools to participate in discussion. Due to COVID-19 restrictions, both focus groups were held online after required school hours at a time that was convenient for group members. Each focus group consisted of a mix of quartiles based on interview question answers.

Finally, a document analysis was necessary in order to better understand factors that played a role in participant levels of technology self-efficacy. Professional development materials from each school were collected and analyzed to determine the characteristics of the technology training to which participants had been exposed. The materials provided were in the form of either a list or calendar with descriptions of the professional development opportunities offered at each site. Participants were also asked to describe how or what type of future professional development opportunities could help increase their technology self-efficacy levels.

I took on the role of participant observer. When involved in data collection for the study, it was necessary for me to have some degree of participation in order to lead interviews and focus groups; however, I also occupied the observer role during data collection, allowing participants to interact authentically with one another and record those interactions.

A limitation of the study involved me serving as facilitator of the interviews and focus groups while also serving as a district digital integration specialist. The participants were reminded to speak freely and honestly, but this relationship may have limitations in the study. An additional limitation may be that the interviews and focus groups were

recorded to be used during data analysis and coding. The participants were aware of the recording; and while it was stated that all information was confidential, this may have limited responses during interviews and focus groups.

Data Analysis

To answer the research questions, I conducted a mixed methods case study. According to Merriam (2009), “data analysis is a complex process that involves moving back and forth between concrete bits of data and abstract concepts, between inductive and deductive reasoning, between descriptions and interpretations” (p. 176); and “the practical goal of data analysis is to find answers to your research questions” (p. 176). Data analysis in this study attempted to develop themes and patterns that explain the reality of teacher levels of technology self-efficacy. In order to make comparisons, themes from Slutsky’s (2016) study were used as a priori to allow for organization and coding of the interview and focus group transcripts.

Data analysis in this study used data triangulation, the combination of multiple data sources and multiple methods of study of the same phenomenon. According to Ary et al. (2006), “The use of multiple sources of data, multiple observers, and multiple methods is referred to as triangulation” (p. 505). Since this case study attempted to identify a variety of factors that may influence teacher technology self-efficacy, the use of multiple sources aided in developing a holistic picture. Table 4 shows the research questions with instruments that were used to answer each question.

Table 4*Research Methods*

Research question	Instrument used	Data analysis
1. What factors affect elementary teacher levels of technology self-efficacy?	-CTIS survey (to determine level of self-efficacy) -Interviews	Current levels of teacher technology self-efficacy were identified through CTIS, and interview and focus groups explored factors that influenced the levels identified by survey results.
2. What similarities and differences exist between and among elementary teachers of varying technology self-efficacy levels?	-Interviews -Focus Groups	Themes compared to Slutsky's (2016) work emerged as a result of coding interview and focus group transcripts.
3. In what ways could identified factors affecting elementary teacher levels of technology self-efficacy be impacted by professional learning opportunities?	-Interviews -Focus Groups -Document Analysis of Professional Learning materials	Understand how and in what ways identified factors related to professional development will be helpful in creating and delivering future professional development opportunities for educators that will enhance their skills for using technology in the classroom.

Role of the Researcher

At the time of the study, I was a digital integration specialist for the district in which the study was performed. I have an interest in understanding factors that influence teacher levels of technology self-efficacy because I believe that understanding these factors can help others to have positive levels of technology self-efficacy which may ultimately help improve student engagement and achievement.

In this study, I took on the role of a participant observer and facilitator. It was necessary for me to have some degree of participation to lead interviews and focus groups; however, I allowed the participants to interact authentically with one another

while their interactions were recorded.

Summary

This research was an extension of Slutsky's (2016) mixed methods case study on the factors influencing teacher technology self-efficacy. The study examined technology self-efficacy of teachers in 11 elementary schools in a district in South Carolina. This study had the same goals as the original study, but extended research strategies (Lund Research Ltd., 2012) about technology self-efficacy. Through replication of Slutsky's research methods, a survey, focus groups, and interviews, a reflection of participant responses was explored in the hopes to improve technology integration in the classroom and increase student achievement.

The purpose of this study was to explore factors that influence teacher self-efficacy with technology integration into the classroom. I was able to take a qualitative approach to explore fears, thoughts, and successes of teaching with the expectation of technology. Chapter 4 presents my findings.

Chapter 4: Results

Introduction

The purpose of this study was to expand the knowledge on elementary teacher technology self-efficacy as it relates to integrating technology in the classroom. The study examined elementary teacher levels of technology self-efficacy, identified specific factors affecting their current levels of technology self-efficacy, identified similarities and differences among teachers of varying technology self-efficacy levels, and examined the role and impact professional learning opportunities have on levels of technology self-efficacy.

The research questions to be answered in this study were

1. What factors affect elementary teacher levels of technology self-efficacy?
2. What similarities and differences exist between and among elementary teachers of varying technology self-efficacy levels?
3. In what ways could identified factors affecting elementary teacher levels of technology self-efficacy be impacted by professional learning opportunities?

The CTIS was used to determine teacher levels of technology self-efficacy. Personal interviews, focus groups, and document analysis were performed to answer the research questions.

Survey Results

The CTIS link was sent to 275 certified, full-time teachers from 11 elementary schools. There were 79 surveys returned, giving a response rate of 28.7%. This survey was a necessary first step in identifying factors influencing teacher technology self-efficacy because the results provided information as to the current self-efficacy levels of

participants making it possible to identify teachers at varying levels of self-efficacy. The CTIS link was forwarded by the Director of eLearning and Integration from the district office to all full-time certified elementary teachers at 11 locations. The survey was sent out at the beginning of February with a two week turn around window for completion. The survey link was emailed to a total of 275 full-time certified teachers. A total of 79 surveys were returned completed, resulting in a 28% response rate. Average online survey response rates are around 26% (People Pulse, 2020). For purposes of quantifying survey results, each of the 21 survey items had five choices using a Likert scale, which were assigned point values ranging from 1 to 5. The following point values were assigned to each descriptor: 1=strongly disagree; 2=disagree; 3=neither agree nor disagree; 4=agree; 5=strongly agree. The interquartile range was then calculated in order to form three levels of technology self-efficacy. The quartile ranges were calculated using the same method Slutsky (2016) used to find three levels of technology self-efficacy based on survey results for this study. The lower 25th percentile quartile of the scores formed the low levels of technology self-efficacy, with a point value range of 21-79. The middle quartiles, or 50th percentile, represent the value for which 50% of the results are lower and 50% of the results are higher. In other words, the middle two quartiles. The upper 75th percentile quartile of the scores formed the high levels of technology self-efficacy, with a point value range of 95-105.

Of the 79 completed surveys, 26.9% of the respondents scored in the low range, 46.2% scored in the middle range, and 26.9% scored in the high range. Of the survey respondents, 3.85% were male and 96.15% were female.

Table 5 shows the overall survey results of respondents in terms of what

percentage of respondents scored at each self-efficacy level.

Table 5

Survey Results at Each Self-Efficacy Level

Self-efficacy level	Percentage of survey respondents who scored at level
Lower quartile (21-79)	26.9%
Middle quartiles (80-95)	46.2%
Upper quartile (95-105)	26.9%

Table 5 shows the three levels with the score results within each range. The lower quartile represents the lower 25% of scores. This quartile has an outlier score of 21 points. The middle quartiles represent the scores falling between the 25% and 75% intervals. The upper quartile demonstrates the top 75% of responses.

Table 6 shows the percentage of each gender that scored in each of the technology self-efficacy quartiles.

Table 6

Results of Self-Efficacy by Gender

Self-efficacy level	Male respondents who scored at level %	Female respondents who scored at level %
Lower quartile	0	21
Middle quartiles	0	37
Upper quartile	3	17

Table 6 shows that overall, there was a higher amount of female respondents and where they fell in self-efficacy quartiles. The number of male respondents was very low, but those who responded were all in the upper quartile for technology self-efficacy.

Age

The respondents were all within five age ranges. Five teachers were between 18 and 24 years of age, 21 were between 25 and 34 years of age, 27 were between 35 and 44

years of age, 20 were between 45 and 54 years of age, and five were between 55 and 64 years of age. Table 7 shows the percent of each age range for teachers who completed the survey.

Table 7

Survey Results by Age Range

Age range	N	%
18-24 years old	5	6%
25-34 years old	21	26.9%
34-44 years old	27	34.6%
45-54 years old	20	25.6%
55-64 years old	5	6%

Table 7 shows that a low number of teachers between the ages of 18 to 24 and 55 to 64 completed the survey. The majority of respondents within the age range of 18 to 24 fell in the lower quartile, while the majority of respondents in the 55 to 64 age range fell within the middle quartiles range. The age range of 34 to 44 had a slightly higher number of respondents in the upper quartile than those between the ages of 25 and 34. Those 34 and younger had an overall higher amount in the upper quartile than those 45 and older.

Experience

The respondents represented a range of experience levels. There were 14 teachers with 1 to 5 years of experience. Fifteen teachers taught between 6 and 10 years. There were 18 teachers with 11 to 15 years of experience. Fifteen teachers had 16-20 years of experience. Finally, 16 teachers had 21 or more years of experience. Table 8 shows the percentage of each experience level of those who completed the survey.

Table 8*Respondents by Experience Level*

Experience level	N	%
1 to 5 years	14	17.9%
6 to 10 years	15	19.2%
11 to 15 years	18	23%
16 to 20 years	15	19.2%
21+ years	16	20.5%

Table 8 shows that there was a fairly even number of teachers who completed the survey based on experience level. The fewest responses were the teachers with the least amount of teaching experience. The highest number of teachers were in the 11 to 15 years of experience range.

Table 9 shows each experience level of survey respondents in terms of what percentage of respondents scored at each self-efficacy level.

Table 9*Survey Results of Self-Efficacy by Experience Level*

Self-efficacy level	1 to 5 years of experience who scored at level %	6 to 10 years of experience who scored at level %	11 to 15 years of experience who scored at level %	16 to 20 years of experience who scored at level %	21+ years of experience who scored at level %
Lower quartile	57.1%	2%	27.7%	6.6%	25%
Middle quartiles	35.7%	53.3%	33.3%	60%	56.2%
Upper quartile	7%	26.6%	38.8%	33.3%	18.7%

The results of Table 9 show that teachers with the least amount of experience scored themselves lower in how they felt with technology self-efficacy, while teachers

with 11 to 15 years of experience ranged higher in technology self-efficacy. Teachers with 21 plus years of experience mostly fell into the middle quartiles range with technology self-efficacy.

Interviews

The CTIS gave all participants an opportunity to select if they would like to participate in a one-on-one interview, a focus group, or both; and requested their contact information if interested. Originally, 19 individuals stated they would participate in one-on-one interviews. All 19 participants were going to be interviewed to allow for a range of technology self-efficacy levels. During the process of scoring surveys and setting up interviews, schools around the United States were being shut down due to COVID-19. Through the process of contacting participants to set up interview times, seven individuals asked to be taken off the interview list due to the pandemic and having the stress of many other things taking place. Twelve remaining interviews were scheduled and conducted from teachers in seven schools. Eight of the 12 interview participants also agreed to participate in focus group discussions.

Table 10

Interview Participants with School, Gender, Age Range, Experience, CTIS Score, and Technology Self-Efficacy

Participant	School	Gender	Age range years	Experience range years	CTIS score	Quartile
Teacher A	1	Female	35-44	11-15	105	Upper
Teacher B	2	Female	25-34	6-10	99	Upper
Teacher C	2	Female	18-24	1-5	50	Lower
Teacher D	3	Female	25-34	11-15	94	Middle
Teacher E	3	Female	25-24	6-10	105	Upper
Teacher F	5	Female	45-54	6-10	83	Middle
Teacher G	5	Female	25-34	1-5	89	Middle
Teacher H	7	Female	25-34	6-10	105	Upper
Teacher I	7	Male	25-34	6-10	101	Upper
Teacher J	8	Female	25-34	1-5	85	Middle
Teacher K	9	Female	35-44	11-15	57	Lower
Teacher L	9	Female	25-34	6-10	83	Middle

There were a total of five participants from the upper quartile, five participants from the middle quartiles, and two participants from the lower quartile. Each interview was scheduled at the time that best suited the participant. The interviews were held through video conference due to quarantine from COVID-19 within the state. A total of 10 questions (Appendix C) were asked. The first two questions were personal background questions. The remaining eight questions were focused interview questions used to answer the research questions. Each interview session was recorded with participant permission and transcribed.

Focus Groups

Following completion of the personal interviews, focus groups were convened. The results on the CTIS showed that 14 participants were willing to participate in focus group discussions. Due to a small number of willing participants, all 14 were going to be

invited to participate. After the pandemic started, 11 participants agreed to meet. Eight of the 11 teachers who participated in focus groups also participated in interviews. The three remaining teachers only wanted to participate in focus group discussions. Two groups were formed to give an even mix of quartile ranges and participants. The participant list was built on teachers who agreed to participate in the interview and focus group or focus group only. The list was sorted and developed based on self-efficacy levels, and participant invitations were extended. Focus Group 1 consisted of five teachers, one from the low quartile and two each from middle and upper quartiles. Focus Group 2 consisted of two participants from the lower quartile, three from the middle quartiles, and one from the upper quartile. Table 11 shows focus group participants, their gender, age range, experience range, CTIS score, technology self-efficacy quartile, and the focus group in which they participated.

Table 11

Focus Group Participation with School, Gender, Age Range, Experience, CTIS Score, and Technology Self-Efficacy

Participant	School	Gender	Age range years	Experience range years	CTIS score	Quartile	Focus Group 1 or 2
Teacher A	1	Female	35-44	11-15	105	Upper	1
Teacher C	2	Female	18-24	1-5	50	Low	2
Teacher H	7	Female	25-34	6-10	105	Upper	2
Teacher L	9	Female	25-34	6-10	83	Middle	1
Teacher M	7	Female	25-34	6-10	85	Middle	2
Teacher B	2	Female	25-34	6-10	99	Upper	1
Teacher F	5	Female	45-54	6-10	83	Middle	1
Teacher J	8	Female	25-34	1-5	85	Middle	2
Teacher K	9	Female	35-44	11-15	57	Low	1
Teacher N	7	Female	18-24	1-5	79	Low	2
Teacher O	9	Female	34-44	11-15	86	Middle	2

Each focus group was scheduled online at a time that suited each participant. Due to government-mandated shutdown from Coronavirus, participants were notified that focus groups would be held through an online platform. Participants had the option to decline participation. A total of six questions (Appendix D) were asked. The first two questions were background questions. The remaining four questions were specific questions used to answer the research questions. Each focus group discussion was recorded using WebEx as the online recording platform. Each discussion was then transcribed in order to find themes in discussion.

Analysis Process

After personal interviews and focus groups were conducted, interview and focus group transcripts were coded to search for factors that influenced participant technology self-efficacy levels. Coding was used to aid in understanding the perspectives of the participants and in analyzing their combined experiences. Coding helped to prevent the interviewer from overemphasizing the importance of any one aspect early in the study and helped ensure a thorough analysis of the entire interview (Charmaz, 2006; Stake, 2010). Coding was performed on each personal interview transcript and each focus group transcript. All transcripts were reread, and labels were created for chunks of data that emerged or matched the themes in Slutsky's (2016) study. Coding allowed for ideas or concepts to emerge from the data. These ideas were grouped into thematic categories. Using the major themes Slutsky used in his research, I made connection to his themes and pulled those same themes that emerged in my research in order to allow for comparisons between studies.

Research Question 1

What Factors Affect Elementary Teacher Levels of Technology Self-Efficacy?

This question was at the core of the study, as the answer to this question has the power to inform educational institutions as to how they can target their resources in a purposeful way to produce positive, far-reaching outcomes (Henson, 2002). Current levels of teacher technology self-efficacy were first identified through the CTIS, and interviews explored factors that influenced the levels identified by the survey results.

The interview protocol consisted of eight items. Items related to identifying factors impacting technology self-efficacy included

1. Tell me about the influence other teachers or staff members have on your technology practices.
2. Tell me about the influence of experience outside of the school setting on your use of instructional technology.
3. What barriers have you experienced in your attempts to use technology in your classroom?
4. What supports have you experienced in your attempts to use technology in your classroom?
5. How often do you experiment or take the time to learn a new technology? In what ways?
6. What factors do you attribute to your self-confidence in using technology in your classroom instruction?
7. Do you consider yourself an innovative teacher? Why or why not?
8. What do you believe would help make you more comfortable in using

technology in your classroom instruction?

In Slutsky's (2016) research, open coding was applied to determine factors that affected teacher levels of technology self-efficacy. In this study, I began with Slutsky's codes as a priori codes to apply to the interview data but also explored ways in which my data did not align with Slutsky's findings. Like Slutsky, two major categories emerged from coding that classified the factors that affect teacher levels of technology self-efficacy. The first category was work-related factors. Included in this category are factors that are influenced by the district or home school of the participant. The second category was personal factors. Included in this category are factors related to the participant's personal life other than the home school or district. Two or more participants expressed all identified factors. Later in discussion of Research Question 2, similarities and differences between and among teachers of varying technology self-efficacy levels and work-related factors found to be common among multiple participants at all three levels will be more explicitly addressed, as will discrepancies among participant responses.

Work-Related Factors

Work-related factors can be broken down into two smaller categories. First, are the people who are part of the school or district. This would include peer teachers, school staff, and district staff. The second category would be things related to operations and resources. Table 12 shows the numbers of interviews where the factor was identified and the percentage of participants who mentioned the factor.

Table 12*Work-Related Factors Count and Percentage*

Factor	N	%
Peer (support)	6	50
Peer (barrier)	3	25
Informational technology support assistant (support)	3	25
Technology coach (support)	10	83.3
Lack of knowledge (barrier)	4	33.3
Lack of time (barrier)	10	83.3

The influence of peers was mentioned by half of the interview participants. Peer support was coded for six of the 12 participants. Peer support included everything from planning, lesson collaboration, or sharing technology-related ideas. In her personal interview, Teacher K noted,

It is great that I can walk across the hall at any given time to get help from my coworkers. One of us might come up with an idea and then we share how we can possibly use technology to enhance the lesson. I am thankful to have someone to collaborate with because I do not always have the ideas on how to incorporate technology.

Not all teachers have a positive experience with peer teachers. Three participants mentioned that sometimes their peers have a negative approach to using technology in the classroom. Teacher F stated,

When we discuss lesson plans and they [peer teachers] discuss using pencil and paper for projects I suggest trying technology and they say, “that is going to take too much time to show the students how to do it, it will never work.”

Table 13 shows the number of times in which peer teachers were coded and the percent coded by technology self-efficacy quartile.

Table 13

Peer Teacher Code Count and Percentage by Technology Self-Efficacy Quartile

Factor	Lower quartile		Middle quartiles		Upper quartile	
	N	%	N	%	N	%
Peer teacher support	3	50	2	33.3	1	16.6
Peer teacher barrier	1	33.3	2	66.6	0	0

Table 13 shows that half of the teachers who were coded as discussing peer teachers as a support were from the lower quartile. There were three from the lower quartile, two from the middle quartiles, and one from the upper quartile of the six who were coded that found peer teachers as a support. There were no participants from the upper quartile who found peer teachers to be a barrier.

Teacher perceptions of local school support for instructional technology was one factor identified. Local school support for technology includes support between and among teachers to collaborate and work with the district technology coach and communication and support with the informational technology support assistant (ITSA). Teacher D noted, “There is a good balance of understanding technology and knowledge of material to match what teachers need.” Teacher C noted, “sometimes it is hard to understand who does what [technology coach or ITSA], but they always help or find out who can solve problems and answer questions that I have.” The support staff was discussed as supportive in most conversations; there was mention of frustration when asking a support person for assistance and not getting answers and therefore having to ask another person to help with the issue. Table 14 shows the number of times in which the technology coach and ITSA were coded by technology self-efficacy quartile.

Table 14

Technology Coach and ITSA Code Count and Percentage by Technology Self-Efficacy Quartile

Factor	Lower quartile		Middle quartiles		Upper quartile	
	N	%	N	%	n	%
Technology coach	4	40	3	30	3	30
ITSA	2	66.7	1	33.3	0	0

Table 14 shows that participants in the lower quartile discussed the support of the technology coach and ITSA frequently. The lower quartile participants found the technology coach to be a support, while the upper quartile had no mention of the ITSA's role as being a support. ITSAs are housed in each school, while technology coaches are shared among schools.

Another work-related factor identified was the amount of time teachers used for instructional technology during the work day. The majority of teachers noted that they use technology in their instruction at least three fourths of their school day. Teachers have found that having one-to-one devices for students allows for more opportunity to use devices in instruction. Teacher G noted, "I use technology for housekeeping purposes as well and giving instruction. Students also complete assigned work in Google Classroom after lessons that have been taught."

Lack of knowledge on tools available or how they worked was another work-related factor identified. Teacher J stated, "It can be frustrating at times because things change so much with different programs. Just when you feel you've mastered it, the next time you use it with students it has all changed." Several participants shared in personal interview discussions the amount of resources that were available was overwhelming.

Table 15 shows the number of times that lack of knowledge was coded and percent coded by technology self-efficacy quartile.

Table 15

Lack of Knowledge Code Count and Percentage by Technology Self-Efficacy Quartile

Factor	Lower quartile		Middle quartiles		Upper quartile	
	N	%	N	%	N	%
Lack of knowledge	2	50	2	50	0	0

Table 15 shows that the participants in the lower and middle quartiles feel they have a lack of knowledge when it comes to technology and programs or tools that are part of their instruction.

Lack of time was a factor identified by 10 participants. Teacher C stated, “Teachers do not have time to search tools and learn how to use them on top of lesson planning and what is required.” Many participants discussed feeling stretched too thin with all the other things that factor into a regular workday. There was discussion during interviews of how it was unfortunate that there was not more time in the classroom spent on using the technology, because everyone is now at home required to use the tools and many students do not understand. Teacher L noted,

I have a completely different perspective now that we are using the technology for all instruction. I have to make sure there is time built in to show students how to use the technology tools we have for them and I have to ensure that I know the programs myself. I plan to change my habits for next school year.

Table 16 shows the number of times lack of time was coded and the percentage by technology self-efficacy quartile.

Table 16*Lack of Time Code Count and Percentage by Technology Self-Efficacy Quartile*

Factor	Lower quartile		Middle quartiles		Upper quartile	
	N	%	N	%	N	%
Lack of time	5	50	3	30	2	20

Table 16 shows that across all quartiles, there is a concern for lack of time as it pertains to integrating technology into their classroom. Over half of the participants' discussion of lack of time came from the participants in the lower quartile.

Personal Factors

The second major category of factors influencing elementary teacher technology self-efficacy was personal-related factors. Table 17 shows the number of interviews in which factors were identified and participants who mentioned the factor.

Table 17*Personal Factors Count and Percentage*

Factor	N	%
Family member (support)	4	33.3
Social media professional use (support)	8	66.7

Table 17 shows that of the 12 individuals who participated in interviews, four of the 12 discussed family members being an outside support, and eight of the 12 discussed social media being an outside support for professional use.

The perceived personality traits of teachers were factors that influenced teacher technology self-efficacy. The personality traits identified as a result of interviews were being innovative and being a risk-taker. Teacher A, who had a very high technology self-efficacy, believed she is innovative: "I am always the first to offer to try new things in my

classroom and I tell my students that it may not work out, but we will work through the problem together. I think it is important that students see that teachers can fail too.” Risk-taking was another personality trait that was identified. Teacher K noted, “I feel like I am sometimes a risk-taker. Sometimes you can be a better person when you step out of your comfort zone.”

Persistence, for the purpose of this study, refers to taking the time to figure things out or problem solve when using technology. Teacher C noted, “I like to try to figure things out on my own. If all else fails, I will ask for help, but first I want to see if I can figure it out myself.” Teacher K, who had a low technology self-efficacy score, when asked if she considered herself an innovative teacher replied, “I think I am innovative, I think quickly, I try to find solutions to things. I am not always the quickest to start using the technology or the best, but I do try.”

Research Question 2

What Similarities and Differences Exist Between and Among Elementary Teachers of Varying Technology Self-Efficacy Levels?

By identifying similarities and differences between and among teachers of varying technology self-efficacy levels, it becomes possible to initially target those teachers who display particular characteristics so they may either receive additional support early on or develop approaches to lead efforts to help others build their skills. The factors were identified through coding of the personal interview transcripts and focus group discussions and examined on the individual’s technology self-efficacy quartile as determined by the CTIS results.

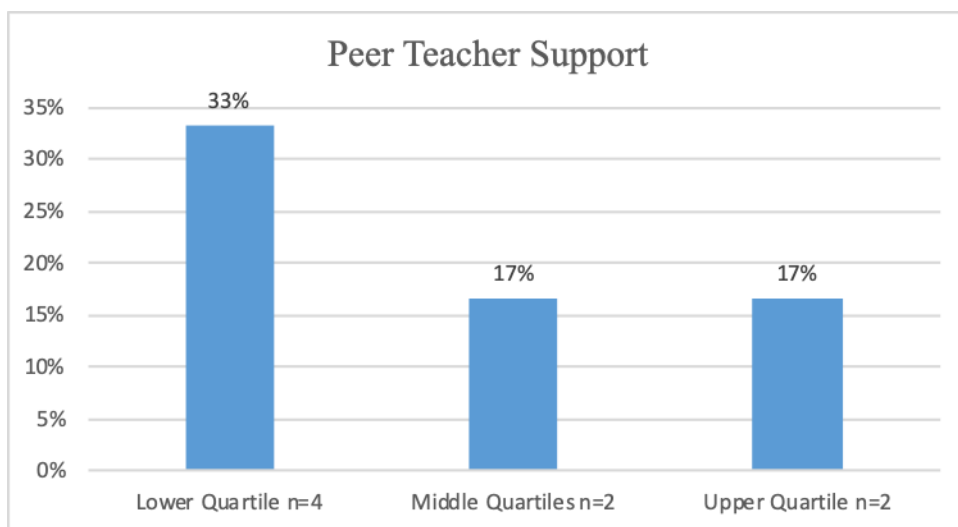
Some questions that were asked during the interview and focus group process that

related to Research Question 2 included

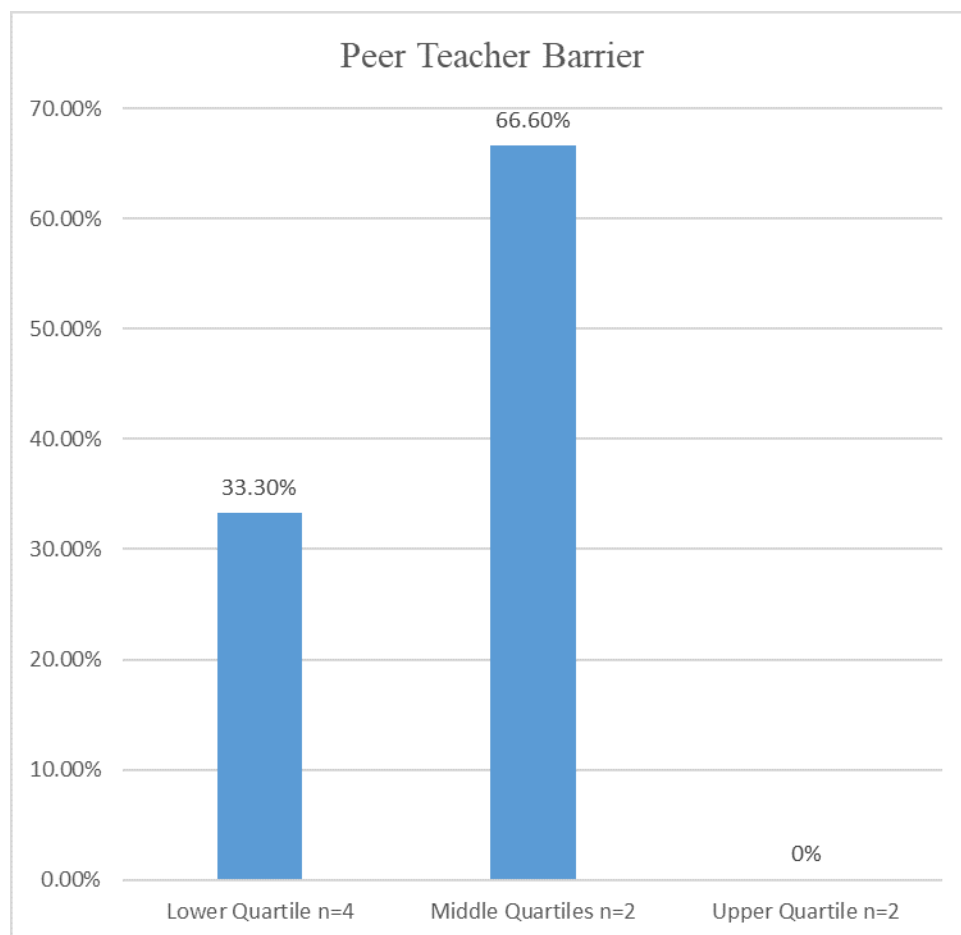
1. Tell me about the influence other teachers or staff members have on your technology practice.
2. What barriers have you experienced in your attempts to use technology in your classroom.
3. What supports have you experienced in your attempts to use technology in your classroom?
4. What factors do you attribute to your self-confidence in using technology in your classroom instruction?

Factors, both work related and personal, were identified through coding of personal interviews and focus groups and then compared between and among participants of varying technology self-efficacy levels in order to identify common themes or those factors that were shared by multiple participants across all three technology self-efficacy levels or individuals of the same self-efficacy level. These common themes are important because they carry leverage across technology self-efficacy levels and support that certain factors may have more of an influence than others in terms of affecting technology self-efficacy.

The biggest theme identified through all interviews was the impact of people. This includes people present in the participant's home school or district or family members. Figure 2 depicts the percent of peer teacher support by technology self-efficacy level.

Figure 2*Peer Teacher Support*

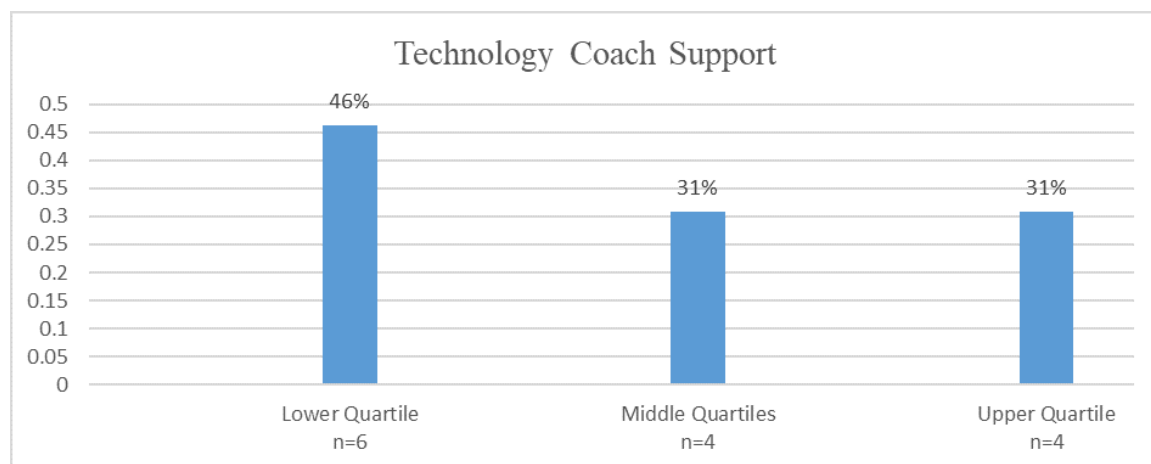
There was fairly even distribution in the middle and upper quartile levels of technology when looking at peer teacher support. The lower quartile equaled the middle and lower quartile together for amounts of time peer teacher support was mentioned. However, differences emerge when you look at the negative impact, or barrier, peer teachers can have. Among those who mentioned the negative impact from peer teachers, 66.6% were from the middle quartiles of technology self-efficacy. The lower quartile accounted for 33.3% of negative peer teacher mentions. No one from the upper quartile mentioned the impact of negative peer teachers. Figure 3 depicts how many times peer teachers being a barrier was mentioned by participants.

Figure 3*Peer Teacher Barrier*

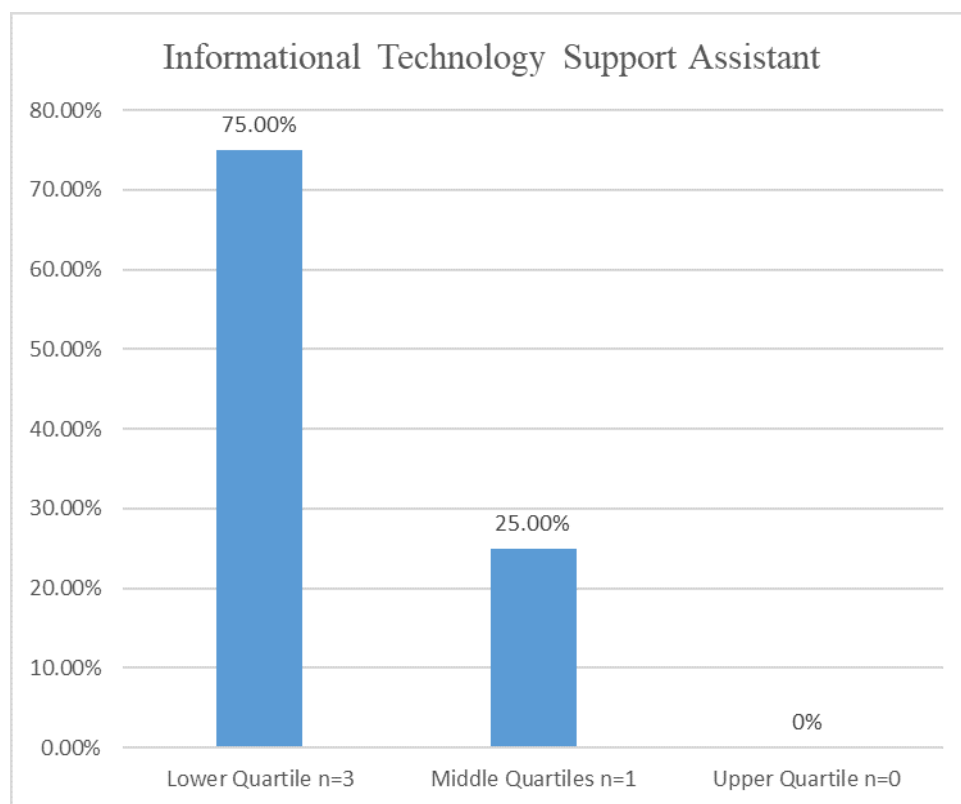
The impact of the technology coach was higher for the lower quartile of technology self-efficacy with 40% of responses. Teacher N noted,

It has been so helpful to have someone to email when I have a question and they [technology coach] set up at time to meet with me or come to my class to model a lesson. I feel better about trying something new when I have an extra set of hands.

The middle quartiles and upper quartile discussed the technology coach as a support around 30% each. Figure 4 shows the technology coach support codes by technology self-efficacy level among participants who mentioned it.

Figure 4*Technology Coach Support Code*

There was some mention of ITSA support in interviews and focus groups. The teachers in the lower quartile mentioned the support of the ITSA 75% and discussed how often they call on them for help. The middle quartiles represented 25% of support from the ITSA. The upper quartile did not discuss the support of the ITSA and noted that they did a lot of troubleshooting problems on their own. Teacher B said, “I usually can fix my own computer issues and I end up fixing my teammates’ issues too. Sometimes it is just easier to do it that way than submit a ticket for help.” Figure 5 represents the coding for ITSA by quartile.

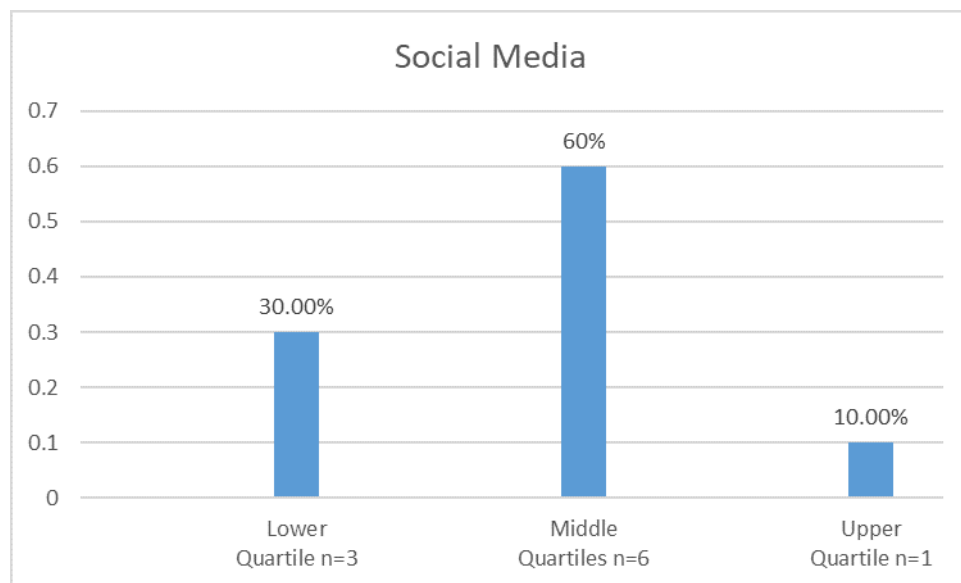
Figure 5*ITSA Code*

Personal factors involved in technology self-efficacy included the support of family members and the use of social media for additional knowledge and support with instructional technology. Slutsky's (2016) research discussed the aspect of social media and how it relates to technology self-efficacy in reference to cell phones and Twitter. All the schools in this study are one-to-one with student devices; therefore, connection with cell phones was not relevant at the elementary level. Twitter has been used as a means of professional learning communities, and Instagram and Facebook have been popular with sharing and gaining ideas from educators across the globe. There was much discussion of how social media was a great place to connect during the quarantine period for COVID-19. Teacher M stated, "I use Facebook as a place to connect with other educators and see

what they are doing in their classrooms.” Figure 6 represents the information for social media coding during interview and focus group discussions.

Figure 6

Social Media Coding



Another mentioned barrier was lack of knowledge when it came to programs or technology. This affected the lower quartile 37.5% and middle quartiles 50% of the time each during interview and focus group meetings. The upper quartile mentioned lack of knowledge 12.5% during focus group discussions. Regardless of grade level or self-efficacy level, participants shared the similar feeling that while there were opportunities available, the majority of current professional development opportunities targeting instructional technology were either not offered at a time convenient for teachers or, in many cases, were structured in a way that was not conducive to effectively developing the specific technology skills of teachers. Teacher L noted,

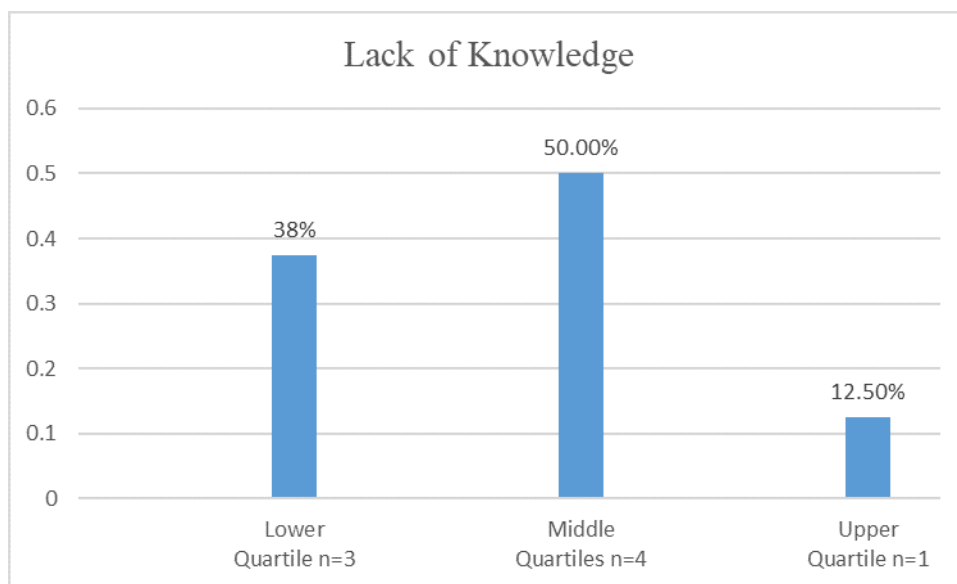
Some of the professional development opportunities that have been offered have had a great thought process to them, but most of the time teachers haven't had

what is necessary to actually apply what the session is on. If it is going to be beneficial then I need to be able to see it and manipulate it to know how to use it in my classroom.

There was a lot of discussion with lack of knowledge, especially during the shutdown due to COVID-19. In general, during focus group discussions, there was talk of how teachers did not feel equipped to properly teach online when they were not fully comfortable using the programs face to face. Figure 7 shows the lack of knowledge coding based on technology self-efficacy level.

Figure 7

Lack of Knowledge Barrier Coding



The most resounding theme identified throughout all the interviews and focus groups was the aspect of time. All the participants shared a belief that there was never enough time to learn and practice using the instructional technology available to them. Whether the participants fell in the low, middle, or upper technology self-efficacy level, they believed more time was needed in the area of instructional technology. Participants

agreed that they lacked the time both at work and at home to build their knowledge of resources and practice using a variety of technology tools. Although some participant reasons for lacking time at home may have differed, all felt they lacked adequate time at work due to the current structure and demands of their work day. Teacher G, who only participated in the interview group, stated,

There is not sufficient time during a workday to learn and practice using technology on top of everything else we have to complete during our 45-minute free period. Some professional development sessions outside of a school day have allowed for learning and practice, but many sessions just go over basics.

Lack of time was cited by a large number of teachers but was significantly higher for teachers with low levels of technology self-efficacy. Those teachers mentioned lack of time 50% of time. Teachers in the middle quartiles mentioned it 33.3% of time, and participants in the upper quartile mentioned it 16.7%. Several participants shared that opportunities were offered during teacher planning periods or after school. The average amount of planning time for the teachers was reported as less than 1 hour. Participants believed that in most cases although this allotted time was adequate to learn the basics of a given instructional technology tool or resource, it was not enough time for teachers to then practice using the tools or resources to the point where they felt confident enough to then go back to their classrooms and integrate them. Teacher D stated,

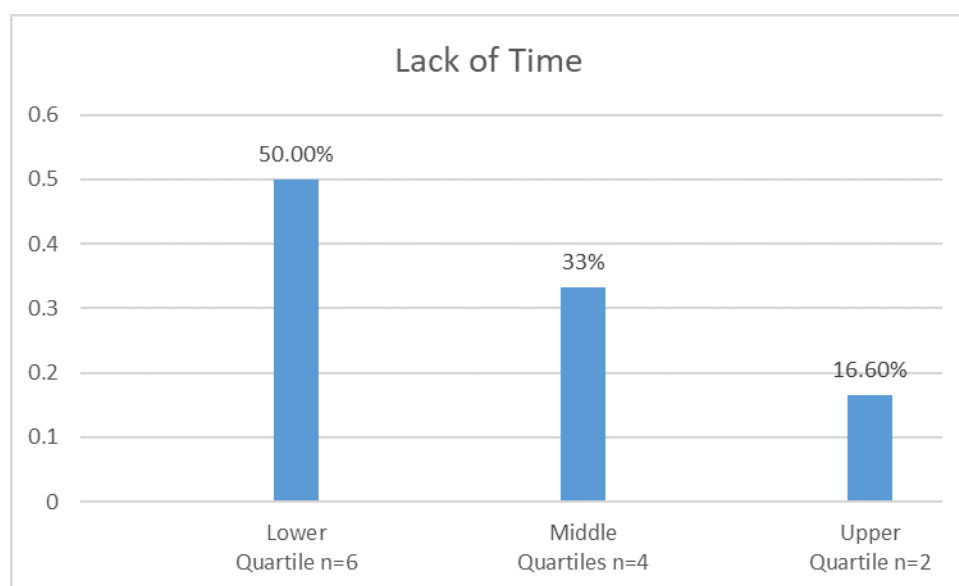
When we have these sessions during our planning period or after school, it is great because it's a short amount of time, but there is always something going on in our minds during the school day or we are exhausted right after school. By the time the session is over we are already checked out and back to our daily schedule

so taking it back is often times forgotten until it is asked about again. Having professional learning on other days that are not part of a regular teaching day allows for full concentration on what is being focused on.

Figure 8 notes the percent lack of time that was coded as a barrier by technology self-efficacy level among those participants who mentioned it during interviews and focus groups.

Figure 8

Lack of Time Barrier Coding



The similarities and differences of the identified factors that existed between and among teachers of varying technology self-efficacy levels were revealed through the coding of the personal interviews and focus groups. Similarities emerged from all teacher levels of technology self-efficacy. Differences occurred where peer barriers were concerned. Peer teachers were barriers when it came to teachers in the middle quartiles of technology self-efficacy. Teachers who had a higher self-efficacy score rarely stated they had a lack of knowledge when discussing programs to use within integration. In general,

site-based people are important to all levels of technology self-efficacy.

Research Question 3

In What Ways Can the Identified Factors be Impacted by Professional Learning Opportunities?

Identifying factors related to professional development may be helpful in creating and delivering future professional learning opportunities for educators and may allow for enhancement of skills for using technology in the classroom (Wang et al., 2004). This question was addressed through interviews, focus groups, and a document analysis of professional development materials from local sites used for this study. The district in this study provides professional development at the beginning of the school year on technology integration. The professional development provided is usually what is referred to as a Google Summit. This professional development allows teachers to attend trainings of their choice based on a menu of options. Programs the district uses are part of the menu to allow teachers to see what to expect for anything new that is being used. School-based trainings are held throughout the year at the discretion of the principal based on the needs of the school at the time. The district changed the overall professional development plan at the start of the 2019-2020 school year and moved all beginning-of-the-year professional development to strictly school based, giving the principal autonomy of how their professional development time was spent. Questions that allowed help in answering this research question included

1. Tell me about your participation in professional development targeting the use of instructional technology. What were the strengths of that professional development? How could it have been improved?

2. Can you describe any professional development or professional learning that has had a positive or negative affect on your self-confidence using technology in your classroom instruction?
3. What do you believe would help make you more comfortable in using technology in your classroom instruction?

Interview and focus groups included questions that addressed professional development including strengths and weaknesses and how the professional learning opportunity impacted the individual's self-confidence using technology. Several categories emerged when examining the professional learning opportunities. Participants shared their overall opinions of their professional learning opportunities. Participants were welcome to share about any professional learning opportunities. This included ones offered by the school or district, workshops outside of the district, conferences, and any others the participants pursued on their own. These were general and not specific to any one particular session or training. Participants also shared their experiences and gave recommendations based on individual sessions or trainings they attended.

Professional development documents from each school were analyzed to verify previous and existing professional development opportunities; and finally, teachers were asked to describe how or what type of future professional development opportunities could help increase their technology self-efficacy levels.

Work-Related Factors Connected to Professional Development

Teacher beliefs about existing professional development opportunities to enhance their skills with instructional technology, teacher beliefs about available work time to learn or practice instructional technology, and teacher perceptions of local school support

for instructional technology were work-related factors connected to professional development.

Time to learn or practice instructional technology during regular work hours was another factor identified by all participants. This time could be structured, as in offered through professional development opportunities, or unstructured, as in teacher planning times each day. Participants in the lower quartile mentioned practice time 14.2% of the time. The middle quartile discussed time to learn 57.1% of time, and those in the upper quartile mentioned time 28.5%. Teacher L stated,

When we had sessions in previous years that involved technology it wasn't really relevant because we didn't have the technology for students one-to-one. Now that we have devices it would be great to have more time to really focus in on what programs we have and how to best use them with students, and walk through things from teacher and student perspective.

Participant Previous Training and Experiences Connected to Instructional Technology.

Participant previous training and experiences could include formal training through professional development, or it could be informal, done on their own time; and it may or may not have been related to their current teaching situation. Some participants had not only participated in training that focused on instructional technology but had also facilitated training that focused on instructional technology at their local schools or beyond. Fifty percent of participants in the middle quartiles of technology self-efficacy mentioned previous trainings; 37.5% of upper quartile and 12.5% of lower quartile mentioned previous trainings related to technology self-efficacy. The majority of teachers

discussed the Google Summit the district held on several occasions. The summits allowed for teachers to select trainings based on the level of understanding they had on the technology tools. School-based trainings by technology coaches were also mentioned, although time to practice in school-based trainings was also mentioned as an area that was lacking.

Professional Development Opportunities

The professional development documents collected from each of the three schools confirmed that all schools were currently offering and had previously offered professional development opportunities connected to instructional technology. These documents were consistent with what participants said during interview and focus groups in terms of a variety of offerings being available, the offering occurring during teacher planning periods or on professional development days, and teachers usually having choice as to which professional development opportunities they attended. Most school professional development opportunities were presented in a “menu” style, as they offered approximately nine sessions for teachers to choose from, allowing the teacher to select three they wanted to further explore. There were approximately 66.7% of those choices that had a focus on instructional technology, while the remaining 33.3% did not.

Only 25% of the professional development opportunities focusing on instructional technology offered at each school required mandatory attendance. Additionally, of the instructional technology offerings, 30% were “one-time only” opportunities that focused on an introduction to the basics of particular instructional technology tools, and very few follow-up classes were offered to build on the basics.

Ideas for Future Professional Development Opportunities to Increase Teacher Technology Self-Efficacy Levels

During personal interviews, participants shared ideas that could help increase their technology self-efficacy levels. Among the ideas identified were (a) more targeted and specialized teacher training on instructional technology, (b) increased knowledge of and access to instructional technology tools and resources, and (c) increased teacher collaboration. The first idea, targeted and specialized teacher training on instructional technology, refers to training offered that targets the varying levels of teacher technology abilities; for example, basic, intermediate, and advanced level training. Teacher H mentioned, “It would be great to have more choice based PD and possibly take teachers who are using the tools and allow them to apply to present at sessions.” Teacher L noted,

We are working to prepare many integrated units with technology components across curriculums, it would be great to use PD time to collaborate with other schools and discuss what different areas are doing for topics and what technology is being used.

Another component of the first idea involves finding different ways and times to offer the workshops as well as making the workshops required.

The next idea participants identified as an aspect that would help increase their technology self-efficacy levels was increased knowledge of and access to instructional technology tools and resources. Participants mentioned the need to feel comfortable with the programs with which they are having students work. They discussed the desire for more training and capabilities to see both sides (teacher and student) of the tools that are being used. Teacher K noted,

The trainings that have been offered are not always prepared for teachers to see both sides of the program. It is difficult to expect students to complete things when we do not really know what the student side looks like. I like to go through things myself so I can help and answer questions.

Through the interviews, focus groups, and document analysis, it seems current professional learning opportunities are not having an impact on peer support barriers, lack of knowledge, and lack of time. However, there is much room for improvement, and many of the identified factors could be impacted. Professional learning opportunities need to not focus on the tools. Instead, they should focus on desired student skills while building in ways to make connections to curriculum and support the lack of knowledge teachers feel they have. Professional development that has a focus on student skills will allow for the lack of time teachers feel it takes to learn and adjust to new tools, by allowing for integration into the curriculum that is already present. The impact professional learning has on teacher technology self-efficacy shows that time to practice and understand skills in trainings is a factor that affected their self-efficacy. Time during professional development activities was mentioned 57.1% of those in the middle quartiles and 28.5% by the upper quartile. The lower quartile mentioned time in professional development 14.2%. Nearly an even amount of participants from all quartiles felt that professional development needed to be differentiated and made relevant to them. The technology self-efficacy factors can be impacted by offering professional learning opportunities that are job-embedded with a focus on creating teacher leadership, personal learning communities, and collaboration among staff.

Summary

The CTIS (Wang et al., 2004) was issued to all certified teachers at 11 participating schools. Results from the survey were used to calculate the lower, middle, and upper quartiles of the teacher technology self-efficacy levels. A total of 12 teachers were selected to participate in personal interviews. The middle and upper quartiles represented 41.6% each of participants, while the lower quartile represented 16.6% of participants for interviews. In addition to the personal interviews, focus groups were conducted with 11 participants; eight of the 11 interview participants also took part in focus groups. There was representation of 27.2% for the upper quartile, 45.5% for the middle quartile, and 27.2% for the lower quartile, giving a fairly even representation for focus group discussion. Professional development materials were also referenced.

Factors that influenced teacher technology self-efficacy were revealed through personal interviews, focus groups, and document analysis of professional development documents from schools. Major categories were formed based on Slutsky's (2016) research, which included work-based factors and personal factors. Subcategories, which supported the teacher included peer teachers, additional district support personnel, and social media. Peer teachers were also found to be a barrier, along with lack of knowledge and lack of time.

The factors were then compared with participant technology self-efficacy quartiles in order to determine the similarities and the differences that exist between and among teachers of varying technology self-efficacy levels. All levels of technology self-efficacy agreed on the impact of peer teachers and technology coach assistance. Differences existed in regard to the ITSA.

Personal interviews and focus groups were also coded with regard to how factors might be impacted by professional learning opportunities. Not all identified factors can be impacted by professional development opportunities such as lack of time, although it is hopeful to positively impact some. Specific improvements can be made to improve professional learning opportunities to positively shape the factors that were identified.

Teacher technology self-efficacy could be positively impacted if the professional development opportunities included increased connections, relationships, and learning through the tools. All quartiles agreed that professional learning opportunities need to be differentiated based on skill level, grade, and possibly content area. Participants from all quartiles also agreed that follow-up and support are needed following professional development.

Participants at all three levels expressed that they were lifelong learners. Although time constraints and other factors contributed to participant opportunities to learn about instructional technology, all of them noted a desire to learn in order to enhance their professional practice.

Chapter 5 focuses on the implications of this research study. Additionally, there is a discussion of how relevant research connects to the study's results and a comparison of findings to Slutsky's (2016) research. The chapter concludes with information about the limitations for this study as well as recommendations for future research.

Chapter 5: Discussion

Twenty-first century skills are no longer an added bonus to a person's resume; rather, they are essential to someone's future success. As a result, educators have a responsibility to equip today's students with such skills (Mullen & Wedwick, 2008). Use of technology is no longer limited to making noninstructional or administrative tasks more manageable and efficient. With today's technological advancements, instructional technology tools exist that create opportunities for teachers and students to more meaningfully and innovatively engage in teaching and learning practices.

This chapter contains a summary of the findings, recommendations from the findings, implications for practice, and recommendations for future research. The purpose of this study was to expand the knowledge on teacher technology self-efficacy as it relates to integrating technology in the classroom. This study examined teacher levels of technology self-efficacy, identified specific factors affecting their current levels, and examined the role and impact professional learning opportunities have on levels of technology self-efficacy.

The research questions to be answered in this study were

1. What factors affect elementary teacher levels of technology self-efficacy?
2. What similarities and differences exist between and among elementary teachers of varying technology self-efficacy levels?
3. In what ways could identified factors affecting elementary teacher levels of technology self-efficacy be impacted by professional learning opportunities?

In order to identify participants, a quantitative survey was used. To answer the research questions, various types of qualitative data were collected and coded to determine major

themes. Teacher levels of technology self-efficacy were determined by the CTIS developed by Wang et al. (2004). Personal interviews and focus groups were utilized to answer all three research questions. During this research the United States faced a shutdown of schools due to the COVID-19 pandemic. Teachers across America were forced out of their regular face-to-face classrooms and tasked with teaching students virtually regardless of training or comfort level. During these uncertain times, one thing that remained the same was that learning continued to take place. Personal interviews and focus groups were held virtually after the shutdown, and there was added discussion of how teaching changed during this challenging time. The research was conducted to discover how to mitigate the factors hindering teachers from integrating technology into their classrooms and how to improve the role professional learning opportunities play in technology integration. This research could be used to inform the district's technology department and other department practices of teacher support and professional learning opportunities.

Findings

Multiple factors that influenced teacher technology self-efficacy were discovered in this study. The results showed that both work-related factors and personal or outside factors played a role in influencing teacher technology self-efficacy. Although not all of the identified factors influenced each of the participants, at least one identified factor influenced one or more participants. Work-related factors identified were peer support and peer barriers, ITSAs, technology coaching, and lack of time. Personal or outside factors identified included support from family members and use of social media for professional use.

Of the factors identified that influenced teacher technology self-efficacy, several work-related factors were connected to professional development opportunities. Additionally, common themes were found between and among participants of varying self-efficacy levels. The first theme indicated that teachers felt there was a lack of available time to practice using instructional technology. A second theme revealed that teachers shared similar beliefs about available professional development opportunities to learn about instructional technology. The third theme showed teacher attitudes toward technology were positive, regardless of their level of technology self-efficacy. Another theme revealed that teachers shared the similar personality traits of being a lifelong learner, regardless of their technology self-efficacy level.

Connections to Professional Learning Opportunities

Over time, with purposeful support and classroom practice, a teacher gains experience with self-efficacy. This is important since teachers who possess high self-efficacy are better able to adapt to evolving technology, making them best prepared to integrate technology into their classrooms (Ertmer & Ottenbreit-Leftwich, 2010; Gilakjani, 2013; Mishra & Koehler, 2006; Tweed, 2013). A teacher's experience with technology significantly influences their classroom technology integration (Liu et al., 2017). Additionally, how frequently a teacher uses technology alongside with their confidence and comfort using and applying technology further mediates classroom technology integration (Liu et al., 2017). All levels of technology self-efficacy had varying likes and dislikes of the professional development opportunities. From interviews focusing on Research Question 3, it appears that the professional development opportunities were often presented as one-time only and given little differentiation.

Teachers from the upper quartile discussed how helpful the Google Summits were and how they offered a variety of topics and pacing. The issue was the timing of the Summit and that teachers were not mentally prepared for all of the new ideas at the very beginning of the school year. Participants also expressed their disappointment in the district doing away with this type of professional development opportunity. This is supported by professional development materials. Research supports that this type of professional learning opportunity has little to no impact on student achievement (Yoon et al., 2007).

Identified factors influencing teacher technology self-efficacy revealed work-related factors showed a relationship to professional development. The first factor related to professional development was teacher perceptions of local school support for instructional technology. Participants shared the perception that their school digital integration specialist was willing, able, and available to support them when teachers needed their assistance with instructional technology. The majority of participants explained that these specialists were helpful and provided one-on-one support when it was requested by the teacher.

Another factor related to professional learning opportunities was teacher beliefs about available professional development opportunities. Although the teachers believed there were several professional development opportunities available and the professional development documents supported this belief, the current structure of such opportunities does not necessarily promote development of teacher technology self-efficacy. The U.S. Department of Education (2010) gave seven major action steps and recommendations for moving American education forward, which included improving teacher training to

promote effective technology use as “teachers need access for research, examples and innovations as well as staff development to learn best practices” (para. 3). Available opportunities are mostly limited to the basics of instructional technology, usually are not required, and are oftentimes one-time only opportunities.

Several participants shared that professional development opportunities at their local school focused on an introduction to the basics of various instructional technology tools and resources and failed to go beyond the basics so as to help teachers understand and explore specific examples of how these tools and resources may be used in their own classrooms. Also, because they focused on the basics, several teachers felt they lacked the confidence to go back to their classrooms and use instructional technology because they had not learned enough to be able to troubleshoot in the event that something went wrong when using the tool or resources. Teachers with lower technology self-efficacy expressed lower confidence in this area, because they were still trying to figure out how to work the program themselves.

Creating and implementing an effective professional development program requires careful thought and consideration. In this research study, all technology self-efficacy levels suggested district professional learning opportunities should be reconsidered, differentiated, and made relevant. Tyson (2013) considered five key steps to better professional learning opportunities: shared vision, shared leadership, choice and differentiation, collaboration, and support. When a school community has a shared vision and commitment to high standards of student achievement, it is better equipped to take an honest look at student learning. This forms a basis for professional learning outcomes (Loucks-Horsley et al., 2009). The vision must be a shared vision. Relying on someone

else's vision leads to a school culture of dependency and conformity; only shared visions take root (Fullan, 1993; Hirsh et al., 2014).

The next key for successful professional learning opportunities is shared leadership. Teachers should not see professional learning opportunities as something simply to attend. Instead, teachers should be given and take an active role in designing and implementing professional learning opportunities. Few teachers have been given the opportunity to design professional learning opportunities, even when those opportunities are targeted toward their peers (Cuban, 2003). A case study in higher education by Turkle (1995) found that when teachers design professional learning opportunities and their opinions are strongly considered, changes in classroom practice occur.

Professional learning opportunities need to be centered on choice and differentiation. During the interviews, participants were asked how to improve professional learning opportunities; nearly half of the teachers suggested having a choice or differentiated professional learning opportunities. Today's teachers are asked to differentiate their instruction, but all too often they attend professional learning opportunities that are taught from a one-size-fits-all approach. This approach is ineffective (Diaz-Maggioli, 2004; Yoon et al., 2007). The district could allow for teachers who have a high level of technology self-efficacy to apply to present at district-wide professional development days and also allow for choices in topics to be presented before pushing out information to staff.

Effective professional learning opportunities do not end when the training is over; there must be ongoing collaboration (Miller, 2020). The desire for a follow-up or two-part workshop was mentioned in multiple interviews and focus groups. Schools are

recognizing the importance of collaboration, and many teachers participate in professional learning communities. Professional learning within communities requires continuous improvement, promotes collective responsibility for individuals, teams, and the school. These learning communities have shown to increase the effectiveness of the educator and student outcomes (Killion & Crow, 2011). Collaboration needs to be embedded into the teacher's job and part of the school day, not be an afterthought (Killion, 2013).

Several professional learning opportunities were offered as one-time only sessions with little to no follow-up. Since these opportunities were offered as isolated events, teachers tended to forget what they had learned. Knowing there would be no follow-up training further discouraged teachers from going out on their own to learn and use instructional technology more because they may have felt the effort to train them were short-lived and sporadic at best. Previous research supports this finding, as Brooks-Young (2005) expressed that a major impediment keeping teachers from making effective use of technology in their classroom was the lack of follow-up training and ongoing support. Lambert et al. (2008) explained that additional and ongoing opportunities for learning, such as further modeling, could help teachers maintain or grow their abilities.

Professional learning opportunities need to be followed up by ongoing support. Within this study, all levels of technology self-efficacy cite the importance of the digital integration specialists and their technology integration. Truesdale (2003) examined differences between teachers who simply attend a workshop and teachers who attend and receive coaching through implementation. The study found that coached teachers

transferred the newly learned skills into their teaching, while teachers who did not receive coaching quickly lost interest and did not implement new skills into their classroom.

Another study of 50 teachers agreed. Teachers who received coaching after attending a workshop were significantly more likely to use new teaching practices in their classroom than those who only attended the workshop (Knight & Cornett, 2009).

A study by Brooks-Young (2005) discussed that teachers need specific professional development opportunities to move into later stages of proficiency and be fully ready to integrate technology as a teaching tool. Salah (2008) also explained the importance of teacher training being specific. In order to move teachers forward and truly develop their technology self-efficacy, teachers could benefit from leveled professional learning opportunities. According to Brooks-Young, “Technology tools can help teachers design activities that prepare students to deal with expanded workplace demands, but only if those teachers are willing to become more advanced technology users themselves and implement new teaching strategies” (p. 15). If schools and districts could offer beginning, intermediate, and advanced classes on instructional technology, teachers would have the chance to build their knowledge and skills of instructional technology over time.

Current School Structure and Work Demands

This case study suggested that current school structure and work demands may have hindered teacher technology self-efficacy development. The responses from all participants were similar in regard to whether or not they felt they had enough time during the work day to learn about instructional technology. Every participant believed they lacked adequate time during the workday to build their skills in this area. This

finding is consistent with previous research (Compeau & Higgins, 1995; Kellenberger & Hendricks, 2003; Littrell et al., 2005; Palak & Walls, 2009) that revealed that teachers believed adequate time and certain skills were necessary in order to use technology.

Teachers in this study cited after school and planning periods as the only times that were available for them to use however they chose; and due to more pressing matters, teachers did not feel they could use the little “free” time that was available to concentrate on learning about instructional technology. Preparing for upcoming lessons, managing paperwork, contacting parents, and inputting grades were all examples of tasks teachers felt took precedence over taking the time to learn about instructional technology.

After school and planning periods do not currently offer enough time for teachers to learn about or practice using instructional technology. Structured time to practice using instructional technology was a main idea cited by all participants as a way to increase teacher technology self-efficacy; but currently, the structure of the workday of teachers excludes this time element. In order for teachers to be able to authentically build their skills with regard to instructional technology, school leaders should think creatively about ways to restructure the workday so as to allow for planned time for teachers to learn about such skills.

Schleicher (2011), who affirmed that 21st century learning is about shifting the ways we do business, supported the findings in this study regarding teacher beliefs about the impediments posed by current school structures. Brown and Luterbach (2011) echoed this sentiment and stated, “Massive changes to the culture of schools and school districts are necessary to properly prepare learners for the 21st century” (p. 22). In order to address this concern, school leaders need to brainstorm ways to address required content through

the means of instructional technology and then subsequently provide training for their teachers. If teachers do not view instructional technology as a vehicle to support them in teaching the required content they must cover, they are not as likely to commit their time to learning about instructional technology. Moreover, it is imperative that having recognized that there have been shifts in the way students learn, educators must follow suit and shift the way in which they teach; and ultimately, educational leaders must be open to shifting the ways in which they promote and support teaching and learning.

Teacher Ideas for Increasing Technology Self-Efficacy

This case study examined teacher ideas for ways to increase teacher technology self-efficacy. Because teachers are the ones instructing students and the ones whose technology self-efficacy we want to increase, what better way was there to find out how, than to ask them directly? Personal interviews and focus groups revealed teacher ideas for ways their technology self-efficacy could be positively influenced. Ideas that were identified emerged as a discussion on factors already presented that were related to professional learning opportunities: more targeted and specialized teacher training on instructional technology and increased knowledge of and access to instructional technology tools and resources.

Other ideas that surfaced were increased teacher collaboration with a focus on instructional technology and teachers would have the opportunity to share, discuss, and explore ways to integrate instructional technology in their instructional practice. Teachers could also benefit from participating in opportunities to observe other teachers and see teacher demonstrations of effective instructional technology use. Seeing and being able to visualize ways to use instructional technology in the authentic context of the classroom

could be very powerful for teachers in helping them to gain the understanding and confidence they need to go back to their own classrooms and implement such strategies effectively. This also promotes vicarious learning experiences, which is one of the identified sources of efficacy (Bandura, 1977).

Given that teachers currently have little time available to learn about or practice using instructional technology, school leaders should consider creative ways to structure the work day so teachers can have release time to participate in this type of learning experience. Means (2001) and Rotherham and Willingham (2009) suggested the need for education policy makers to make deliberate and concentrated efforts toward developing and providing teacher training with the intent to increase teacher confidence and capacity to use instructional technology effectively.

Attitude Alone Is Not Enough

Another implication of the case study suggested that although teacher beliefs and attitudes towards instructional technology are positive, they do not necessarily have a very high technology self-efficacy. Previous research on attitudes in relation to self-efficacy demonstrated a strong correlation between the two (Bandura, 1994; Lumpe & Chambers, 2001; Palak & Walls, 2009; Vannatta & Fordham, 2004). However, findings from this study suggest that attitude alone does not affect self-efficacy levels. For instance, all participants described similar, positive beliefs and attitudes toward instructional technology; but only four of the participants had very high technology self-efficacy.

All participants believed technological skills are essential to the future success of students. This belief echoes previous studies conducted by Wenglinsky (2006), who

found that students will benefit from technology because it will prepare them for the technology rich environment in which they live and must work; and by Means (2001), who concluded that those students who develop technological skills will be at an advantage over those who lack the same skills. All participants shared the attitude that they liked or enjoyed technology because it helped create meaningful learning experiences and helped make learning relevant to today's students. In conjunction with this finding, the U.S. Department of Education (2010) and March (2006) cited the ability of technology to make learning real, rich, and relevant to the personal lives of students now and in the future. Ultimately, this finding supports the need to examine multiple aspects in relation to technology self-efficacy in order to develop a more comprehensive understanding of how technology self-efficacy is most significantly influenced.

Comparison of Results for Replication

This study is an extension by replication of the work of Slutsky (2016). This study focused on factors that influenced technology self-efficacy of elementary teachers, while Slutsky's study focused technology self-efficacy of middle and high school teachers. Both studies looked at work-based factors and outside factors that influenced technology self-efficacy. Both studies looked at peer support and barriers as factors. In Slutsky's study, peer support was evenly affected across all self-efficacy levels. In this study, peer support was higher in the lower quartile and even in middle and upper quartiles. Looking at peer barriers, Slutsky's study had 0% of teachers in the lower quartile discuss barriers; and this study had 0% in the upper quartile. There were fairly similar findings when it came to technology support assistance between studies. In Slutsky's study, 37.5% of the lower quartile discussed support assistance; in this study, 46.1% of the lower quartile

mentioned support assistance. The middle and upper quartiles had very similar results, with Slutsky's results showing 37.5% for the middle quartile and 25% for the upper quartile. This study had 30.7% for the middle quartile and 23% for the upper quartile. Technology or academic coaches also had similar results, with Slutsky's study having 37.5% and this study having 46.1% of lower quartile discussion. The middle quartile for Slutsky was 33.1%, and this study showed 25% for discussion of coaching assistance. This study had 0% of the upper quartile that discussed technology coaching, while Slutsky's study had 11.1% discussion. One factor that could have made a difference in numbers was that this study did not have coaches housed in buildings, reducing time spent in face-to-face interaction.

Lack of time was discussed by all quartiles in both studies. The lower quartile in both studies had similar results in discussion of time. Slutsky's (2016) lower quartile results were 55.6%, and the results of this study were 58.3%. The middle and upper quartiles differed by approximately 15% between studies. Using social media as professional development was discussed in both studies and had a large margin of difference. Slutsky's discussion was heavily on the use of Twitter, while this study had a strong use of Facebook for social media professional development and connection. This study showed that 71.4% of discussion was about social media, and Slutsky's study showed 28.6%. Social media has grown in the last several years, and much of it has an increased focus on social professional development.

While not all results were exactly similar, it was found that there were many of the same factors that influenced technology self-efficacy in the lower grade levels as there were in the upper grades. The teachers in this study discussed that they are in the

beginning process of learning how to use the technology in their lessons as well as instructing students on how to use the technology. The district is in its third year of one-to-one devices for all students. Teachers from both studies suggested differentiation in professional development and follow-up after the training.

Findings in Relation to Theoretical Framework

The theoretical framework for this study was grounded in Bandura's (1977) social cognitive theory of which self-efficacy is a major component. Social cognitive theory views humans as being proactive organisms who engage in self-reflection, self-regulation, and self-organization before deciding to adopt specific behaviors (Bandura, 1977). The theory also suggests that personal, behavioral, and environmental factors affect efficacy. Because the focus of this study was to identify factors that influenced teacher technology self-efficacy, it was appropriate to use Bandura's (1977) social cognitive theory as it takes into account multiple types of factors that may play a role in influencing one's decision to adopt or carry out a specific behavior.

Overall, the results of this study in relation to social cognitive theory supported various types of factors including personal, behavioral, and environmental, and contribute to the development of one's efficacy. Certain personality traits were identified as influencing one's technology self-efficacy; for example, the majority of those participants who discussed their willingness to persevere and troubleshoot when faced with challenges while using instructional technology had higher self-efficacy than those who did not identify with this trait. This finding aligns with what Bandura (1994) believed about innovative achievements requiring a sustained investment of effort while not knowing what the results will bring. Similarly, Vannatta and Fordham (2004) found that

risk-taking and being open to change contributed to teacher decisions to use technology. Behavioral factors were identified in this study, as those participants who had advanced knowledge of instructional technology had higher self-efficacy than those who lacked knowledge of instructional technology, and mainly this increased knowledge was due to the decisions of some teachers to go above and beyond on their own time to learn how to use technology. Finally, environmental factors were found to play a role as well. Several participants expressed that barriers existed which kept them from being able to learn about and use instructional technology. Such barriers included the current structure of the work day, daily work demands, and lack of time.

Participants also shared ways in which they believed their technology self-efficacy could be increased. Many of these responses were aligned with one or more of the general sources of efficacy as presented by Bandura (1977), which include performance accomplishments, vicarious experiences, verbal persuasion, and emotional or physiological arousal. All participants expressed the need for more time to practice using instructional technology, which is not only tied to performance accomplishments but also constructivist thinking as people learn and acquire knowledge through experience, or people learn by doing (Jaramillo, 1996). Additionally tied to performance accomplishments was the finding that participants expressed the need for specialized training that built on itself overtime so as to allow them to grow their confidence and skill with regard to specific instructional technology tools and resources. According to Bandura (1977), performance accomplishments are especially influential because they are “based on personal mastery experience” (p. 195).

Implications for Practice

This research provides qualitative data about the factors influencing teacher technology self-efficacy and the impact professional learning opportunities play. The findings, while not generalizable to all districts, do provide a glimpse into what needs to be considered when pursuing increased technology integration in the classroom. Current professional development plans and opportunities need to be reconsidered and transformed into true professional learning opportunities. This would include allowing teachers to plan, design, and deliver the professional learning opportunities. Professional learning opportunities will need to be differentiated for individual teachers. Professional learning opportunities will be opportunities for teachers to collaborate, coach, and grow as leaders. Professional learning opportunities will be ongoing and followed up with ongoing support and coaching. Teachers will be involved in the shaping and creating of a shared technology vision.

Overall knowledge of using technology for instruction needs to start at the collegiate level to prepare undergraduate students for ways to integrate technology into their lessons. According to the framework of P21 (2019) and ISTE (2017) standards for educators, it is recommended that the focus for teachers should be on how to use technology meaningfully to integrate it seamlessly into classroom lessons and activities as a means to enhance instruction for student engagement, empowerment, and learning (Gomez, 2020).

Planning a professional development that trains a cohort of mentor teachers that will allow for assistance of teachers at varying levels of implementation into classroom instruction is key to successful achievement for teachers and students. The mentor

teachers could later serve as presenters during Google Summit trainings where teachers are grouped by their ability level when involving technology implementation. Proper professional development will allow teachers to participate and contribute to a learning community whose goal is to share best practices and enhance teaching practices through technology integration. Teachers will benefit from the collaboration and available resources. Students will benefit from the opportunity to learn via the technology in a more interactive way than they may have. This type of environment fosters a positive learning environment where students can better thrive academically.

Limitations and Recommendations for Future Research

This case study focused on teacher technology self-efficacy. The teachers actual use and skill of instructional technology was not observed, so comparison between teacher technology self-efficacy as they perceived their own ability and confidence in regard to instructional technology and their actual ability to effectively use technology was not made. Therefore, it is recommended that future research make this comparison to identify what, if any, disparities exist between teacher self-perceptions of their confidence in their ability to use instructional technology and their actual implementation or use of instructional technology. Classroom observations could provide researchers with important information that may reveal additional factors that influence teacher technology self-efficacy.

Because the purpose of this study was to investigate what factors influenced teacher technology self-efficacy levels, teachers were not chosen based on the grade level or subject area they taught, nor were they chosen based on their age, gender, or years of teaching experience. Since some of these factors have been identified as influencing

teacher technology self-efficacy it is recommended that future research concentrate on one or more of these factors to determine the degree to which these factors influence teacher technology self-efficacy.

Conclusion

The purpose of this case study was to identify factors that influenced teacher technology self-efficacy. Several factors, including work-related and outside or personal factors were revealed as playing some role in developing one's self-efficacy. Increasing one's self-efficacy is important because efficacy deals with one's own perceptions of their abilities, and a person's thoughts influence their actions. Research has shown that when people have high self-efficacy, they are more motivated to adopt certain behaviors (Henson, 2002).

Overall, the results in relation to social cognitive theory supported that various types of factors, including personal, behavioral, and environmental, contribute to the development of teacher technology self-efficacy. Certain personality traits were identified as influencing one's technology self-efficacy. Additionally, behavioral factors were identified in this study as those who had advanced knowledge of instructional technology had higher self-efficacy than those who lacked knowledge of instructional technology. Finally, environmental factors were found to play a role as well. Participants also shared ways in which they believed their technology self-efficacy could be increased. These responses were aligned with several general sources of efficacy as identified by Bandura (1977); namely, vicarious learning experiences, physiological arousal, and mastery experiences or performance accomplishments.

One implication was that several identified factors influencing teacher technology

self-efficacy had a relationship to professional development, including teacher perceptions of local school support for instructional technology and teacher beliefs about available professional development opportunities. The findings from this study highlighted the important aid local school digital integration specialists provide teachers. Additionally, future professional development opportunities should focus on educating teachers about all that is available to them as a starting point to promote access to and teacher use of instructional technology. Teachers could also benefit from leveled professional development opportunities.

Another implication of this case study suggests that current school structures and work demands may hinder teacher technology self-efficacy development, thus school leaders should think creatively about ways to restructure the work day so as to allow for planned time for teachers to learn such skills. A third implication of the study was teacher ideas for ways to increase their technology self-efficacy. Several ideas were identified: (a) more targeted and specialized teacher training on instructional technology, (b) increased knowledge of and access to instructional technology tools and resources, (c) increased teacher collaboration with a focus on instructional technology, and (d) creating opportunities for teacher observations and demonstrations. There is a need for leaders to make it a priority to develop and provide teacher training with the intent to increase teacher confidence and capacity to use instructional technology effectively.

The final implication of the case study was teacher beliefs and attitudes toward instructional technology may have been positive, but that did not necessarily translate to having very high technology self-efficacy. School leaders need to go beyond communicating the advantages of instructional technology, because many teachers

already recognize the benefits; instead, school leaders need to concentrate on high-quality training for teachers in the area of instructional technology.

We know technology is what is relevant to students today, and we know that we live in a digital world. It is imperative that educators equip students with the skills that will not only allow them to survive but also thrive in a global market. Before we can hope to build student skills for the future, we must first focus on building the skills of those who have a significant impact on student learning, the teachers. Educational stakeholders should take into consideration the implications and recommendations of this research study as they attempt to make important decisions that will have far-reaching effects on the students and teachers of today and in the future.

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Appendix A

Permission to Use Survey

Paige,

You have my permission to use the survey in your research, with the condition of properly citing the source.

All the best,

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Appendix B

Computer Technology Integration Survey

Direction:

The purpose of this survey is to determine how you feel about integrating technology into classroom teaching. For each statement below, indicate the strength of your agreement or disagreement by circling one of the five scales.

Below is a definition of technology integration with accompanying examples:

Technology integration: Using computers to support students as they construct their knowledge through the completion of authentic, meaningful tasks.

Examples:

- Students working on research projects, obtaining information from the internet.
- Students constructing Web pages to show their projects to others.
- Students using application software to create student products (such as composing music, developing Google Slides presentations)

Using the above as a baseline, please circle one response for each of the statements in the table:

SD=Strongly Disagree, D=disagree NA/ND=Neither Agree nor Disagree, A=Agree, SA=Strongly Agree

1.	I feel confident that I understand computer capabilities well enough to maximize them in my classroom.	SD	D	NA/ND	A	SA
2.	I feel confident that I have the skills necessary to use the computer for instruction.	SD	D	NA/ND	A	SA
3.	I feel confident that I can successfully teach relevant subject content with appropriate use of technology.	SD	D	NA/ND	A	SA
4.	I feel confident in my ability to evaluate software for teaching and learning	SD	D	NA/ND	A	SA
5.	I feel confident that I can use correct computer terminology when directing students' computer use.	SD	D	NA/ND	A	SA
6.	I feel confident I can help students when they have difficulty with the computer.	SD	D	NA/ND	A	SA
7.	I feel confident I can effectively monitor students' computer use for project development in my classroom.	SD	D	NA/ND	A	SA
8.	I feel confident that I can motivate my students to participate in technology-based projects.	SD	D	NA/ND	A	SA
9.	I feel confident I can mentor students in appropriate use of technology.	SD	D	NA/ND	A	SA
10.	I feel confident I can consistently use educational technology in effective ways.	SD	D	NA/ND	A	SA

11.	I feel confident I can provide individual feedback to students during technology use.	SD	D	NA/ND	A	SA
12.	I feel confident I can regularly incorporate technology into my lessons, when appropriate to student learning.	SD	D	NA/ND	A	SA
13.	I feel confident about selecting appropriate technology for instruction based on curriculum standards.	SD	D	NA/ND	A	SA
14.	I feel confident about assigning and grading technology-based projects.	SD	D	NA/ND	A	SA
15.	I feel confident about keeping curricular goals and technology uses in mind when selecting an ideal way to assess student learning.	SD	D	NA/ND	A	SA
16.	I feel confident about using technology resources (such as spreadsheets, electronic portfolios, etc.) to collect and analyze data from student tests and products to improve instructional practices.	SD	D	NA/ND	A	SA
17.	I feel confident that I will be comfortable using technology in my teaching.	SD	D	NA/ND	A	SA
18.	I feel confident I can be responsive to students' needs during computer use.	SD	D	NA/ND	A	SA
19.	I feel confident that, as time goes by, my ability to address my students' technology needs will continue to improve.	SD	D	NA/ND	A	SA
20.	I feel confident that I can develop creative ways to cope with system constraints (such as budget cuts on technology facilities) and continue to teach effectively with technology.	SD	D	NA/ND	A	SA
21.	I feel confident that I can carry out technology-based projects even when skeptical colleagues oppose me.	SD	D	NA/ND	A	SA

Appendix C

Interview Questions

Interview Questions as Related to Sources of Efficacy

Interview Questions	Aspect of Efficacy
1. How long and in what roles have you been in education?	Personal
2. Do you enjoy using technology outside of education?	Mastery/Vicarious Learning Experience
3. Tell me about your participation in professional development targeting the use of instructional technology. What were the strengths of that professional development? How could it have been improved?	Mastery/Vicarious Learning Experience
4. Tell me about the influence other teachers or staff members (may be individuals or students) have on your technology practices.	Personal
5. Tell me about the influence of experience outside of the school setting on your use of instructional technology.	Mastery/Vicarious Learning Experience
6. Do you consider yourself an innovative teacher? Why or why not?	Personal
7. What barriers have you experienced in your attempts to use technology in your classroom?	Personal
8. What supports have you experienced in your attempts to use technology in your classroom?	Personal
9. How often do you experiment or take the time to learn a new technology? In what way?	Personal
10. What more can you tell me about your experiences with instructional technology in your classroom? In education in general?	Behavioral

Appendix D

Focus Group Questions

Focus Group Background Questions:

1. What role does technology play in your everyday life?
2. What role does technology play in education today?

Focus Group Specific Questions:

3. What factors do you attribute to your self-confidence in using technology in your classroom instruction?
4. Can you describe any professional development or professional learning that has had a positive or negative affect on your self-confidence in using technology in your classroom instruction?
5. What do you believe would help make you more comfortable in using technology in your classroom instruction?

Summary Question:

6. How would you describe your attitude toward using technology in your classroom instruction?