Spring 2020

The Impact of Professional Development on Technology Integration: A Mixed-Methods Action Research Study of Teachers New to Ocean County School District

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Submitted In Partial Fulfillment Of The Requirements

For The Degree Of Doctor Of Education In

Curriculum And Instruction

College Of Education

University Of South Carolina

2020

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DEDICATION

This is dedicated to my parents, Ron and Maryanne. This dissertation would not have been possible without the love, support, encouragement, and meals you provided me throughout the process. You instilled in me the love of learning and the drive to achieve my goals. I will never be able to thank you enough for everything you have done for me. This is for you, with love.

ACKNOWLEDGEMENTS

Many people contributed to the completion of this dissertation. I would like to acknowledge several people who had a significant impact on me and on my work.

First and foremost, I have to thank my dissertation chair, Dr. Michael Grant, for his support, guidance, and time. This document is a direct result of the patience and kindness he showed me over the last few years. Also, thanks to my dissertation committee — Drs. Fatih Ari, Anna C. Clifford, and William S. Morris — for the time and effort they put into improving my work.

To my sisters, Megan and Sara, thank you for checking in on me and for the encouragement. You were always there to listen or to help. To my nieces and nephew, thank you for being so understanding when I had to do my homework. To my grandmother, thank you for the prayers. They were so appreciated and helpful to me.

To Chrissy Robinson, Colleen Beck-Ungvarskey, Pat Freda, my friends, and my fellow educational technology coaches, thank you for being so positive about this goal and for giving me the time, resources, and ability to complete this dissertation. Your support helped me more than I can say.

ABSTRACT

The purpose of this mixed-methods action research study was to evaluate the impact of a technology integration professional development program on teachers who were new to the Ocean County School District. This study was conducted at one middle school with teacher-participants (n = 4) from different grade levels and subject areas. All teacher-participants were new to the district but not new to teaching. Each participant had access to a laptop computer and an interactive white board. The school district was a one-to-one device district, so students, too, had their own laptops to use in the classroom.

Professional development was provided to all teachers at the school by a district educational technology coach. This professional development was delivered in a whole group professional learning community setting. After this, teacher-participants took part in several other professional development sessions including one-on-one meetings, co-planning, modeling of lessons, and coteaching. Quantitative data were collected with the Teacher Technology Questionnaire in a pre-post design and Likert-type scales; and qualitative data were collected from in-depth semi-structured interviews, classroom observations, and teacher observation reflections.

Questionnaire data were analyzed with descriptive statistics. Collectively, the participants' scores increased across the study's duration and the instrument's five subscales. However, individually, participants reported different perceptions. Using the qualitative data, initial descriptions of the participants' classrooms, technology integration strategies, perceptions of their experiences with technology integration, and

experiences with the professional development were generated. After inductively analyzing the qualitative data, five themes emerged to describe the participants' experiences. These were (a) persistent issues with technology that prevent teachers' technology integration, (b) teachers' positive and negative experiences that enable or prevent technology integration, (c) teachers' perceptions of their current practices, readiness to integrate, and future plans for integration, (d) teachers' perceptions of technology and technology integration for students, and (e) teachers' perceptions of the professional development, and its effects on them and their technology integration. The findings of this study support the use of several different types of professional development to improve teachers' perceptions of readiness, meet the needs of teachers, and increase technology integration in the classroom.

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CHAPTER 1

INTRODUCTION

National Context

Technology is seemingly everywhere in America. The availability and use of cell phones, computers, tablets, and wearable devices have increased significantly over the last decade. For example, the Pew Research Center found that the use of cellular phones, computers, and tablet devices increased from 2004 to 2015 (Anderson, 2015). The study reported that 92% of American adults owned a cell phone and that 68% of those Americans owned smartphones (Anderson, 2015). Adults in today's society are using technology more than ever. A 2018 Pew study found that 68% of adults in the United States used Facebook, and of those users, 75% used it daily (Smith & Anderson). As more people are using and accepting technology in their daily lives, there is a need for more information and preparation for this incorporation.

The more technology becomes a part of our lives, the more comfortable people are with using it. Technology has become a part of many established careers and is creating jobs that did not exist 20 years ago. Education has also seen an influx of technology in the classroom. There is an expectation, now, for students to learn about technology and its different applications and programs before graduation. With the abundance of technology found in schools today, teachers, too, need to have adequate training on and knowledge about how to use the tools at their disposal effectively (Inan & Lowther, 2010). Technology integration can help teachers improve how curriculum is

taught, but the requisite knowledge and skills necessary to utilize the technology effectively may not be something teachers readily have (Al-Awidi & Aldhafeeri, 2017). In a national study of K-12 teachers, it was found that "six in 10 teachers feel they are inadequately prepared to use technology in classrooms, according to the survey, and those over 43 [years old] express less confidence in their ability to harness technology effectively" (Roland, 2015). If teachers do not feel prepared to use technology in the classroom, how will they effectively teach children to use it?

In her research, Gülbahar (2007) stated, "Reaching the desired level in terms of both quantity and quality for teaching, in-service training and integration of technology into curriculum depends on the *support services* provided in these fields" (p. 953). Teachers of all experience levels need the proper support and training to implement technology appropriately into the classroom. Technology integration must be supported by administrators, peers, and coaches. "The process of effective technology integration should not be facilitated as a stand-alone event, focusing solely on technical skills" (Tondeur, van Braak, Ertmer, & Ottenbreit-Leftwich, 2017, p. 571). Providing training, and then following up with teachers to make sure that the training was understood and can be put into practice, is an important part of the implementation process. If there is no follow-up to the training, if it is a stand-alone event, teachers may not see the importance of the professional development.

Local Context

This action research took place at Southeast Middle School (a pseudonym), which was a public middle school and part of Ocean County School District (a pseudonym). State and state data references have been removed to protect the identity of participants.

From district data, Ocean County School District is committed to providing technology and training students to use in safe and ethical ways while encouraging critical thinking, creativity, communication, and problem-based and collaborative learning. In order to achieve this goal, Ocean County has become a one computer to every student district. Through this program, each student, from kindergarten through 12th grade, has been issued a device for use at school to aid in learning. According to district data, students in grades 3-12, at most schools, are permitted to take the devices home, providing them the opportunity to continue learning outside of the classroom. This constant access to a computer serves as a tangible example of how important a part school district believes technology will be in students' lives and futures.

With such easy access to devices, many school and district administrators in the district are interested in technology becoming a larger focus in the classroom, but they are having trouble getting students and teachers to buy into the implementation. Of the six local high schools, only 1 had 100% participation of students in the one-to-one device program during the 2016-2017 school year. Another high school had an estimated 60% of devices that had not been checked out or used by students in the same school year. While there is not yet hard data, a commonly held notion among technology department employees as to why the students at one school have all checked out a device and those at the other schools have not is due to administrative involvement. Teachers need administrative support to make technology integration successful (Inan & Lowther, 2010). Through informal conversations with principals, administrators who have seen what can be done with the available technology resources are interested in educational technology becoming more of a focus for teachers and students. These principals are

working to improve the implementation of devices into classrooms. This is shown through the growing number of administrators' requests for teachers to include technology integration in their lesson planning and the inclusion of monthly staff technology integration trainings. These administrators have put an emphasis on the devices being used in the classrooms and encouraged both teachers and students to make the use of these devices a daily habit.

Through informal observations conducted at district technology meetings, when the staff try to determine why the technology integration has not been embraced by teachers and students, a number of answers are routinely provided. One common answer is that teachers often express several frustrations when they are asked to integrate technology into lessons. These include an uncertainty of whether students will have their devices in class or not, if the devices will be charged, and if the devices will be working correctly. Experiences in the past with technology and its integration have shaped the current beliefs about it that many teachers hold (Ertmer, 2005; Mueller et al. 2008). Another frustration is that many upper level educators in the district have been teaching the same course for a number of years and do not want to change their teaching. These lessons have worked for them, and these teachers are not interested in creating new lessons that students then may not be able to participate in without having a device in class. These teachers do not believe that the change will improve their lessons. Instead, staying with the tried-and-true formula that includes a prepared lecture, a PowerPoint, and worksheets or handouts has been effective up to this point for many district teachers.

More frustrating for teachers than the uncertainty of if the devices will be brought to class in working order or changing lessons that were successful in the past have been

the students' devices themselves. Based on their experiences with the early integration of laptops, students, too, have become disillusioned with technology integration. The one-to-one program began in the Ocean County School District in 2013. Students in grades 6 through 8 were given a tablet device that connected to an external keyboard. This device was brand-new, it was not one that was part of the district's laptop pilot program. The chosen device was an updated version of one included in the pilot. Teachers and administrators did not get to try this updated device out before it was purchased and deployed to schools. As such, the device was subject to on-the-job inspection.

While administrators, teachers, and students were positive about the possible opportunities afforded to them by a one-to-one program (i.e., students having access to devices at home, no need for computer lab time, online collaboration between students), there were negative aspects that seemed to overshadow these positives. One such negative aspect was that the keyboards, suggested and provided by the computer company that sold the devices, often did not connect to the tablet correctly. Another issue was the charging ports. The chargers had to be plugged in to the ports in a specific way and were difficult for students to use. Finally, the keyboards' internal batteries broke often, rendering the keyboards useless. As the devices were newly manufactured, replacement parts were not in abundance when the devices began to break, causing many students to have to wait weeks for devices to be repaired and returned. Despite these issues, these same devices were deployed into the high schools a year later.

Students who were in middle school when these devices were put into place are now seniors in high school. Over time and with these experiences, the levels of trust students and staff had in these devices, or any the district may provide it seemed, was

low. This loss of trust led to a reduction in students checking devices out for the school year. Through informal questioning, I have found that students do not check out devices for several reasons. Some students admitted that they did not want to carry around something that would rarely work. Other students did not want to keep up with the efforts involved in getting them repaired. Still others simply liked learning the way they always had, where the teacher gave the information needed, and students completed the required paperwork.

In the 2017-2018 school year, all district students in grades three through five and nine through 12 were issued a new laptop to replace the original devices they had been using. During the 2018-2019 school year, middle school students were given these newer devices, as well. Convincing students and teachers alike to buy into these new devices has been difficult for the district's technology department. Rebuilding the students' and staff's opinions of technology integration and the need for laptops in the classroom has been a process.

One way the district's technology staff has begun to improve technology use and integration has been through professional development sessions. Using whole group school staff meetings and professional learning communities at various schools, the districts' educational technology coaches have been demonstrating different programs, showing new software, and providing training to teachers on a monthly or semi-regular basis. While these meetings have been successful in helping to get technology back into classrooms, teachers are still somewhat hesitant to fully integrate technology.

Statement of the Problem

The school district views coaching as a valuable resource for both veteran and new teachers alike. Coaching teachers through professional development is one way the school district has begun to integrate not only technology, but other areas of focus as well. For example, each elementary school has a dedicated State Reading Coach. Middle schools each have a literacy coach, as well. Numeracy coaches work in all elementary and middle schools throughout the district. Several high schools employ instructional coaches as well. Finally, a small group of educational technology coaches are deployed on an as-needed basis to the 32 district schools. During the 2018-2019 school year, there were eight educational technology coaches on staff. These coaches work in both school buildings and at the district office for professional development sessions and training purposes.

During their district-led orientation, any new teacher, regardless of if they are new to the profession, will be given a laptop and strong encouragement to use technology daily in lesson plans. They will receive technology training on the use of different tools, websites and software programs at their home schools, as per principals' request. To keep new teachers from becoming overwhelmed, they have the opportunity to schedule one-on-one training times with coaches in any area. The district encourages teachers to reach out to coaches for guidance in lesson planning and coteaching.

Teachers who are new to the school district do not know about past issues with technology integration. These teachers may not have used technology in their classrooms in the past but will be expected to use it in their current positions. Following up with new teachers after school-based professional development sessions can lessen the burden

placed on new teachers and provide a better professional relationship between coaches and teachers.

Purpose Statement

The purpose of this action research was to evaluate the implementation of a technology integration professional development program for teachers who were new to the Ocean County School District.

Research Questions:

1. How does a technology integration professional development program impact teachers' perceptions of readiness to integrate technology within the classroom?
2. How does instructional technology focused professional development remove teachers' barriers to integrate technology in the classroom?
3. Based on data collected during implementation, how do new district teachers respond to technology integration support?

Statement of Research Subjectivities and Positionality

I began working in the Ocean County School District in 2006. At that time, the only technology I had access to were a desktop computer, an overhead projector, and a shared computer lab. As technology crept into the school district, so did my interest in using it in the classroom. In 2008, Promethean Boards were installed in the local schools. These boards, and the software that went with them were game changers to many of us teachers; they provided a whole new outlook on technology for me. I had the ability to do so much more with and for my students because of these devices. My lesson plans began to include interactive Flipcharts, embedded videos, and links to websites for

students to view. The addition of these boards and the software made such an impact on how I was able to deliver my lessons.

In 2010, I began a Computing in Education master's program. Through this degree program, I was able to learn more about how technology can be integrated into the classroom, ways to engage students and increase their involvement in lessons, and new technology tools to use in my teaching. That same year, I became a part of a district pilot program for iPad use in the middle school classroom. The school district provided me with a cart of iPads that students could use during my English class. These iPads made a big difference in the way I taught and the way my students learned. For example, I could explain concepts to students using websites and apps that we all never could access before. The topics I was learning in my professional classes were directly being applied to the lessons and students in my classroom. The educational experience I gained from my college courses combined with the hands-on practice I was seeing in my classroom made me better understand the importance this technology would have on students' futures. These 21st century skills encouraged engagement, technology knowledge, communication abilities, and collaborative work in students (Brenner & Hauser, 2015). Skills and teaching methods that were once considered experimental in education (e.g., augmented reality, virtual reality, coding) are now being used daily to prepare students for the jobs they will hold in the future.

In 2013, I became an educational technology coach for Ocean County School District. This new position allowed me to combine the education I received in my master's program and the hands-on experience I gained with my students when implementing iPads. In this new role, I was able to help other teachers find success

integrating technology. The year I began in this new position, the school district piloted a new program for students to have one-to-one devices in their classrooms. Laptops, rather than iPads, were chosen for this pilot program, the idea being that laptops with physical keyboards would give more functionality and software choices (e.g., Microsoft Office) to teachers and students. All teachers who took part in this program were given a device like the students would have. My part in this program was to train teachers on how to use the new devices. The goal of this training was to give teachers the background knowledge and experience necessary for them to feel comfortable in using these laptops with students in the classroom.

My experience with the iPad pilot program, and the education I received on technology use in the classroom prepared me well for my new role. I was able to help teachers become more comfortable with the new devices because I had been where they were. I had real-life experiences to share with teachers about successes and failures I had when implementing devices in my classroom. I understood the pressures and anxieties that came with trying something new and the fear of failure. This experience helped me to establish trust with the teachers in the program.

Since this pilot program, I have built relationships with teachers across the district. Knowing me and my background as a teacher and technology integrator, teachers will reach out to me to ask technology questions, request my help to plan lessons using technology, and invite me into their classrooms to show students new tools. These relationships have taken years to build but are solid.

With teachers who are new to the school district, however, I have to start at the beginning when building trust. The recommendation of a veteran teacher will only get

me so far. New teachers have so many things to get used to and so much curriculum to learn. Allowing me, a stranger, into their classroom to use their teaching time is not always a welcome idea. I chose this research topic to learn if providing professional development to groups of teachers, showing what options are available, and then working with teachers in a one-on-one follow-up meeting to plan lessons, review information, and ease fears would improve the teachers' willingness to integrate technology. I want teachers who are new to the district to feel as inspired and excited about the technology available to them as I did when my classroom received a Promethean Board and iPads.

Positionality was not a factor in my study. I conducted my action research study in a school at which I am not a faculty member. The outsider status that I had was helpful when gathering data. I was able to be a 'fly-on-the-wall' in teachers' classrooms. I did not have the personal, emotional attachment to the students in the classrooms that were a part of the study that a classroom teacher might have (Herr & Anderson, 2005). The teacher-participants who were involved in my study did not have any preconceived ideas about my role that I was able to detect.

My research paradigm for this study focused on the implementation of an instructional technology professional development program into the classrooms of teachers new to the school district. Pragmatism focuses on actions and consequences (Creswell, 2014). It allows for an idea to be explored, negotiated, and improved upon. The teacher-participants and I were able to explore technology integration and improve upon ideas for its implementation into lesson plans. Although I was acting in the role of a coach, including teacher-participants as stakeholders in my research, asking for their ideas and input, encouraged them to become more interested in integrating technology

into lessons without my educational interests and emotions towards the subject becoming too pronounced. Also, it was made clear to teacher-participants early on in the study that I was in no way evaluating them or their technology integration. The teacher-participants were more responsive to me in my participant observer role once they were aware that I would not be evaluating them or their teaching, but simply working with them to integrate technology.

My worldviews and life experiences have given me the confidence to feel comfortable in many different types of classrooms. This strengthened my research because I was open to all possibilities of classrooms, teachers, and students. My study was improved by the classrooms I worked in. This is due, in part to the varying types of learning, gender, and socioeconomic levels I was exposed to during this study. Being able to observe how different students and staff members take to the implementation of instructional technology was very interesting.

Definition of Terms

Coaching — was operationalized as "an interactive process that helps another person improve, learn something, or take performance to the next level" (Payne, 2007, p. 2).

Coteaching — defined when two classroom teachers "share responsibility for planning, delivering, and evaluating instruction for a group of students" (Friend & Reising, 1993, p. 6).

Digital native — was a moniker that applies to the generation that grew up with modern technology, typically the Internet (Lei, 2009).

Enablers to technology integration — were those aspects and components, including

resources and supports, that helped teachers to integrate technology successfully within their classrooms (Ertmer & Ottenbreit-Leftwich, 2010).

First-order barriers — were defined as impediments to technology integration "that were *external* [emphasis added] to the teacher and included resources (both hardware and software), training, and support" (Ertmer, Ottenbreit-Leftwich, Sadik, Sendurur, & Sendurur, 2012, p. 423)

New district teachers — referred to educators who were new to the school district, regardless of past teaching experience.

One-on-one coaching professional development — was defined as "individualized support that takes into account the practice of the educators and provides feedback" (Rezzonico et al., 2015, p. 718).

Professional development — was operationalized for this research as "structured professional learning that results in changes in teacher practices and improvements in student learning outcomes" (Darling-Hammond, Hyler, & Gardner, 2017, p. v).

Professional learning community — was a community of educators that encouraged "teachers to collaborate on their professional work, analyze student data, and assess student learning" (Wilson, 2016, p. 48). However, for this study, the term *professional learning communities* was interchangeably used with *whole group* to describe the professional development sessions. Teachers attended the professional development sessions monthly during their planning periods.

Second-order barriers — was defined as those impediments to technology integration "that were *internal* [emphasis added] to the teacher and included teachers'

confidence, beliefs about how students learned, as well as the perceived value of technology to the teaching/learning process" (Ertmer et al., 2012, p. 243).

Self-directed learning — was operationalized as "the professional development arising from the teachers' own initiative, i.e. the process is internally determined and initiated" (Mushayikwa & Lubben, 2009, p. 376).

Self-efficacy — was "a belief in one's own abilities to perform an action or activity necessary to achieve a goal or task" (Watson, 2006, p. 152).

Teacher readiness to integrate technology — defined "teacher perception of their capabilities and skills required to integrate technology into their classroom instruction" (Inan & Lowther, 2010, p. 141).

Technology integration — was broadly defined as using hardware and software tools available in schools and classrooms in effective and efficient ways so that technology is meaningful to teaching and student learning (Dockstader, 1999).

Whole group professional development — was operationalized for this study as "school-level professional development offers teachers more opportunities to engage in professional conversations around their practice and makes it more likely that a majority of teachers will dedicate themselves to shifts in instructional practices" (Shea, Sandholtz, & Shanahan, 2018, p. 204).

CHAPTER 2

LITERATURE REVIEW

The purpose of this action research was to evaluate the implementation of a technology integration professional development program for teachers who were new to the Ocean County School District. This study was guided by three research questions: (1) How does a technology integration professional development program impact teachers' perceptions of readiness to integrate technology within the classroom?, (2) How does instructional technology focused professional development remove teachers' barriers to integrate technology in the classroom?, and (3) Based on data collected during implementation, how do new district teachers respond to technology integration support?

This review identifies research that has already been completed on professional development and teacher readiness. The scope of this review focuses on teachers' readiness to implement educational technology in K-12 classrooms. Specific topics include perceived enablers and barriers for teachers to technology integration, the impact of professional development on technology integration, and the perceptions of technology integration. One of the criteria used to compile this literature review was based on keywords searches in the Education Source, ERIC, and JSTOR databases. Peer reviewed articles largely from the years 2012-2019 were searched using multiple keywords, including: professional development, technology integration, technology-enhanced learning, teacher training, teacher beliefs, technology learning, technology education, technology in teaching, teacher professional development, teacher development,

e-learning, technology innovation, instructional technology, types of professional development, educational technology research, teacher readiness, educational technology, technology use, teachers' perceptions, computers in education, teacher learning, classroom integration, technology, education, importance, technology integration, technology use, coaching, coteaching, one-on-one, one-on-one training professional learning communities, and inservice teachers. Articles were read and evaluated for appropriateness to the topics included in the action research study. Some articles included are more than five years old because they were determined to be valuable resources and the information found in them could be important to this study. Their results had a direct bearing on the proposed study or were helpful in clarifying understanding about the topics included. A second criterion used to choose articles for this literature review was based on their bibliographic references in other articles.

The first area of research in this literature review focuses on teacher readiness to integrate technology. Included in this section is a description of educational technology, what teacher readiness means, and teacher beliefs about technology and integration will be examined. Also, perceived enablers and barriers to technology integration will be discussed in this section. The second area of the review will focus on professional development and how it can be used in schools. Different types of professional development will be explained and discussed. A third area of focus will be teacher perceptions of technology integrations and how or why these perceptions were formed.

Technology Integration

The National Center for Education Statistics (2002) defined technology integration as "the incorporation of technology resources and technology-based practices

into the daily routines, work, and management of schools" (p. 75). This broad definition is appropriate for general use for school districts and universities. Technology integration for these large institutions does involve daily routines and the overall management of schools. Generally, this definition is valid. In terms of classroom technology integration, however, this definition may not be specific enough.

In this study, technology integration was defined as using the technology hardware and software tools available in effective and efficient ways so that technology is meaningful to student learning (Dockstader, 1999). The focus with this definition was on using technology to support classroom routines and meeting teachers' needs to help them increase student academic learning (Ertmer, 2005; Nelson, Voithofer, & Cheng, 2018). Technology integration that does not directly affect the classroom, student learning, or teacher planning was not included in this study. Teachers' readiness to integrate technology successfully and meet the needs of students was based on several factors, including enablers and barriers (Ertmer, 1999).

Teacher Readiness to Integrate Technology

Classroom teachers are essential to the integration of technology that is meaningful to student learning. The readiness teachers feel toward technology integration has an influence on its implementation (Kopcha, 2012). Teacher readiness to integrate technology was the "teacher perception of their capabilities and skills required to integrate technology into their classroom instruction" (Inan & Lowther, 2010, p. 141). Teachers who feel that their skills are advanced enough will integrate technology.

In their study, Petko, Prasse, and Cantieni (2018) linked teacher readiness to integrate technology to school readiness to integrate technology. Their research

identified that school readiness included:

> perceived importance of educational technology in the given school, goal clarity with regard to the expected outcomes, a supportive school principal, good technological infrastructure (including hardware, software, content, and support) and formal and informal exchange on this topic with colleagues (p. 10).

They concluded that support from schools is needed for teacher readiness to implement technology integration to increase.

Enablers and Barriers to Teacher Readiness

Several aspects impact teachers' readiness to implement technology integration. These aspects may be positive or negative, depending on teacher experiences (Ertmer, 1999). Teachers' readiness to integrate technology is, therefore, impacted by (a) enablers and (b) barriers. These are based on teachers' beliefs and attitudes towards technology integration (Ertmer, 1999; Russell, et al., 2003; Taimalu & Luik, 2018).

Enablers to technology integration. Enablers to technology integration were those aspects that helped teachers to integrate technology successfully (Ertmer & Ottenbreit-Leftwich, 2010). Teachers' comfort with technology impacts integration, and those teachers who feel confident in their skills and knowledge concerning technology are more likely to integrate it into lessons (Inan & Lowther, 2010; Sugar, 2005). So, enablers remove or mitigate barriers to technology integration.

Another enabler to technology integration is the background knowledge teachers have with technology. This can be learning done in preservice coursework teaching or during inservice.

Preservice technology integration. Technology integration has become a focus in preservice teacher education. In 2016, the Department of Education stated, "Every graduate of a teacher preparation program should possess a set of skills regarding educational technology that reflects modern teaching and learning environments" (Office of Educational Technology). In accordance with this, technology integration tools and techniques have become a part of many university preservice teaching programs. Although there are concerns that some universities are teaching technology, but not integration (Russell et al., 2003; Roland C., 2010; Watts-Taffe, Gwinn, Johnson, & Horn, 2003). Preservice teachers who have courses that expose them to technology tools and how to integrate them into practice are more likely to implement technology in their own classrooms (Littrell, Zagumny, & Zagumny, 2005; Roland, 2010). The more confident preservice teachers' feel about their technology abilities, the more likely they are to gain a level of self-efficacy and integrate technology into teaching (Banas & York, 2014; Ertmer & Ottenbreit-Leftwich, 2010; Mueller et al., 2008; Raphael & Mtebe, 2017; Vongkulluksn, Xie, & Bowman, 2018). Making sure that preservice teachers have the exposure to and training with technology tools that can be used in the classroom will improve their understanding of technology integration and willingness to implement these tools when they are teachers themselves.

Inservice technology integration. Content or discipline-specific knowledge can act as an enabler that teachers can use to build upon when integrating technology (Ertmer & Ottenbreit-Leftwich, 2010). Teachers who have taught the same subject for many years or have transferred to the education field from the private or corporate sectors may find that the knowledge they have of their content area may be so solid that they can

focus more on how they teach and using technology to do so. For example, these teachers may not have a background in integrating technology, but if they know well what they are teaching, they can see how integrating technology into their lessons will benefit student learning (Tondeur, Kershaw, Vanderlinde, & van Braak, 2013; Tsai, 2015; Wang, 2013). Integrating a technology tool into a classroom using a content-based implementation may improve a veteran teachers' willingness to try a new way of teaching (Mueller et al., 2008). If the content they know and are comfortable with is incorporated into the technology's implementation, they may see the connections with and value of the technology tool.

Barriers to technology integration. Just as there are enabling factors that influence teachers' technology integration, there are also barriers that can keep them from successful implementation. Hew and Brush (2007) identified more than a hundred different types of barriers to technology integration but were able to break them down to specific categories. These categories are: "(a) resources, (b) knowledge and skills, (c) institution, (d) attitudes and beliefs, (e) assessment, and (f) subject culture" (p. 226). These categories can be further broken down into first-order barriers and second-order barriers. First-order barriers consist of external factors to technology integration (Ertmer et al., 2012). Second-order barriers are made up of internal factors (Ertmer et al., 2012).

First-order barriers. First order barriers were those impediments the teacher has little control over. Ertmer et al. (2012) defined these as "*external* [emphasis added] to the teacher and included resources (both hardware and software), training, and support" (p. 423). Traditionally, first-order barriers are due to lack of funding, support staff, or hardware (Davidson, Richardson, & Jones, 2014; Inan & Lowther, 2010). Providing

funding for devices, software programs, and wireless capabilities can impact the elimination of first-order barriers. If funding is not available or is removed after implementation has begun, it is hard to maintain teacher support and trust for technology integration (Duran, Brunvand, Ellsworth, & Şendağ, 2012). Schools that lack the hardware needed to facilitate technology integration have an obvious barrier. Teachers at schools that do not have access to devices cannot effectively integrate technology (Inan & Lowther, 2010). This barrier is one that can be lessened, however. Government, state, and local funds are available to schools to aid in technology purchasing (General Accounting Office, 1998; U.S. Department of Education, 2003).

A school's culture can also be considered a first-order barrier and may be more difficult to overcome. A supportive school culture is an important part of technology integration and reducing first-order barriers (Barbour, Grzebyk, Siko, & Grant, 2017). A community of peers, administrative support, and access to resources all make up a school's culture (Ertmer & Ottenbreit-Leftwich, 2010). In a school with a positive culture, teachers can collaborate on classroom organization, lesson plans, and how technology integration can be implemented into curriculum (Cifuentes, Maxwell, & Bulu, 2011). When a school's culture is not inclusive of technology integration, teachers may be less likely to implement it (Batane & Ngwako, 2017; Russell et al., 2003). For technology integration to be successful, school environments must be supportive to teachers (Zhao, Pugh, Sheldon, & Byers, 2002). A school's administration can encourage the formation of and reliance upon a community of peers. Schools that have strong leadership in place when implementing technology integration are often more successful in this implementation (Grant, Ross, Wang, & Potter, 2005; Silvernail & Lane,

2004). Administrators who provide resources like common planning, protected time for planning, encouragement, and professional development opportunities focused on technology implementation can improve teacher's interest in technology integration and improve a school's culture (Duran et al., 2012; Littrell, Zagumny, & Zagumny, 2005; Russell et al., 2003). A school culture, based on support and encouragement, can help to lessen some first-order barriers.

Second-order barriers. Second order barriers are those that teachers may be able to exert some control over. Ertmer et al. (2012) defined second-order barriers as those impediments to technology integration "that were *internal* [emphasis added] to the teacher and included teachers' confidence, beliefs about how students learned, as well as the perceived value of technology to the teaching/learning process" (p. 243). While first-order barriers can physically halt technology integration, second-order barriers may cause more damage to the implementation process (Ertmer, 1999). According to Ertmer (1999), "Even if every first-order barrier were removed, teachers would not automatically use technology to achieve … meaningful outcomes" (p. 52). Teachers' second-order barriers include personal beliefs about pedagogy, technology, and their own skills (Chen, 2008; Ertmer, 1999).

Teacher perceptions of technology and technology integration are a significant second-order barrier. Teachers may have negative values and beliefs about the importance of technology in the classroom. Those who feel negatively about technology integration or who have had a bad experience with technology in the past may not be willing to integrate technology (Ertmer, 2005). Veteran teachers who are comfortable in their teaching routines may not feel comfortable in the changes to pedagogical beliefs

that can take place when integrating technology (Vongkulluksn, Xie, & Bowman, 2018; Levin & Wadmany, 2006). Professional development is one way in which teachers can increase their comfort level with technology and reduce their fears (Ertmer et al., 2012). Use of professional development models can increase the knowledge and skills teachers already have, while decreasing their technology integration fears and resistance (Ertmer et al., 2012).

Professional Development

Through professional development, teachers' beliefs about technology integrations and attitudes towards implementation can be altered (Tondeur et al., 2017). Technology integration in education is not just providing laptops, tablets or iPads to students. Professional development in schools is a key part of an effective integration (Lawless & Pellegrino, 2007). School-based professional development can be found in the forms of workshops, classroom observations, and modeling activities that teachers can relate to and use in their own classrooms (Ertmer, 1999). Hew and Brush (2007) found that effective technology integration professional development:

> (a) focuses on content (e.g., technology knowledge and skills, technology-supported pedagogy knowledge and skills, and technology-related classroom management knowledge and skills), (b) gives teachers opportunities for 'hands-on' work, and (c) is highly consistent with teachers' needs. (p. 238)

There are several types of professional development that can be used to increase teachers' comfort with, knowledge of, and performance in technology integration. Types of professional development models include (a) coaching and coteaching, (b)

professional learning communities, (c) one-on-one sessions, (d) whole staff instruction, and (e) self-directed learning. Each of these is discussed in greater detail below.

Coaching and Coteaching

One type of professional development uses instructional coaches as facilitators for learning. Payne (2007) defined coaching as "an interactive process that helps another person improve, learn something, or take performance to the next level" (p. 2). Coaches work with team members to improve existing abilities, increase knowledge of a skill or idea, or to overcome a problem or issue (Payne, 2007). The interactions and relationship between the coach and the mentee is significant (Payne, 2007; Desimone & Pak, 2017). Coaches must listen to their mentees and work with them to see results. In the field of education, an instructional coach's role has been to help teachers take their existing knowledge and beliefs and adapt them to or include into them new practices for instruction (Desimone & Pak, 2017; Ertmer & Ottenbreit-Leftwich, 2010). Through coaching, professional development can be provided in a way that will balance teachers' internal beliefs and external obligations in terms of technology integration (Desimone & Pak, 2017).

A coach's role "is to offer support and encouragement to help teachers reach their fullest potential, thus having an impact on student achievement" (Wolpert-Gawron, 2016, p. 59). Teachers need to see how the technology fits into their classroom and their content (Desimone & Pak, 2017; Ertmer & Ottenbreit-Leftwich, 2010; Hew & Brush, 2007; Veenman & Denessen, 2001). A coach's job is to work with teachers to help them understand the technology, apply their professional development learning to the classroom and lesson plans, and integrate the technology to support student achievement

(Desimone & Pak, 2017; Ertmer & Ottenbreit-Leftwich, 2010; Hew & Brush, 2007; Inan & Lowther, 2010). One way to successfully implement a coaching model is through coteaching (Desimone & Pak, 2017).

Coteaching is when two classroom teachers "share responsibility for planning, delivering, and evaluating instruction for a group of students" (Friend & Reising, 1993, p. 6). This coaching strategy can be displayed in several ways. Friend and Riesing (1993) identified five coteaching structures that can be used effectively in the classroom as (1) one teach, one assist (2) station teaching (3) parallel teaching (4) alternative teaching (5) team teaching. In the one teach, one assist method, which was used in this study, one of the teachers acts as the lead and the second teacher moves around the room to reinforce information or help students. This method is impactful because teachers are able to try new techniques (Friend & Reising, 1993) and collaborate in a new way.

Like with any type of professional development, there are positive and negative aspects to coteaching. Coteaching can build confidence, knowledge, and collaborative skills for teachers of all experience levels (Altstaedter, Smith, & Fogarty, 2016). Teachers must work together to plan, teach, and assess lessons, allowing for both teachers and the students to increase knowledge and understanding of the learning (Altstaedter, Smith, & Fogarty, 2016). In a study by Turan and Bayar (2017), 12 teachers who participated in a coteaching experience identified the effects of coteaching on their classrooms. This research produced positive results. Six teachers believed that their lessons would be more effective due to using this type of teaching, and six teachers felt that the ability to work with students individually would improve (Turan & Bayar, 2017). A negative aspect of coteaching noted in this study was the increased planning and

determining which teachers would be responsible for the planning (Turan & Bayar, 2017). Teachers also identified there could be an issue with authority when two teachers are managing the class (Turan & Bayar, 2017). The possibility for two teachers to plan lessons and work with students can have an immediate impact on how teachers approach their lesson planning and willingness to implement new ideas.

Coaching, either with teachers as a group or in a coteaching setting, could help to increase teachers' technology knowledge and to facilitate the process of implementation into the classroom (Desimone & Pak, 2017; Hew & Brush, 2007; Nelson, Voithofer, & Chang, 2018; Rezzonico et al., 2015). One way to do this is through coaches modeling for teachers how they would implement a tool into a lesson (Crawford, et al., 2017).

Embedding a coaching component into teacher learning models makes teachers more comfortable with technology and more proficient in their technology integration (Lawless & Pellegrino, 2007). In a study by Sailors and Price (2010), professional development that added follow-up coaching to a workshop model of training increased the implementation of comprehension strategy. They also found that student achievement in the measure of standards-based reading was higher in the classrooms of teachers who utilized coaching than the classrooms of those who did not (Heineke, 2013; Sailors & Price, 2010). Showers and Joyce (1996) also noted the improvement of implementation due to coaching. They wrote:

> Teachers who had a coaching relationship—that is, who shared aspects of teaching, planned together, and pooled their experiences—practiced new skills and strategies more frequently and applied them more appropriately. (p. 14)

Through coaching, educators can improve integration skills (Thomas, Bell, Spelman, & Briody, 2015).

Coaching experiences can improve teachers' intrinsic motivations, as well. Charteris, Smardon, Foulkes, and Bewley (2017) found that "coaching and feedback are seen to stimulate teacher reflection, self-analysis and self-direction" (p. 549). Reflective educators who are more open to the suggestions and ideas of others can channel this mentality into their teaching and student interactions, as well.

Professional Learning Community

The use of coaching to facilitate professional development can take on several forms. Coaches are often a part of a school's professional learning community. In this research, a professional learning community was a community that encourages "teachers to collaborate on their professional work, analyze student data, and assess student learning" (Wilson, 2016, p. 48). Professional learning communities were made up of teacher peers who work in the same grade level or subject area (Desimone & Pak, 2017). When coaches were a part of these communities, they should participate in the roles of facilitators or guides (Desimone & Pak, 2017). Through these professional learning communities, teachers and coaches can discuss data collection and analysis, student learning, difficulties of implementing new technologies or strategies within the classroom, and they share ideas and strategies for improving instructional practices (Coburn & Woulfin, 2012; Crawford et al., 2017; Desimone & Pak, 2017). From these communities, a vision can be created about the group's shared goal for student performance (Senge, 1990; Teague & Anfara, Jr., 2012).

While teachers and coaches spend time in professional learning communities discussing learning and instruction, a professional learning community's main focus should be student learning (DuFour, 2004; Teague & Anfara, Jr., 2012). Staff members who participate in these communities must have a strong relationship with one another, including mutual respect, trust, knowledge of each other's strengths, weaknesses, and a shared purpose for them to be successful (Gallucci, Van Lare, Yoon, & Boatright, 2010; Teague & Anfara, Jr., 2012). Working in a collaborative, respectful environment with colleagues will help to encourage a clear understanding of the mission and values that the professional learning community is working to achieve (Dehdary, 2017).

One way to create effective professional learning communities is through professional development. Effective professional development is made up of several characteristics. In her study of schools as workplaces, Little (1982) found that ongoing, natural professional development occurred when (a) teachers engaged in frequent, continuous, and increasingly concrete talk about their practice; (b) teachers were frequently observed and provided with useful critiques of their teaching; (c) teachers planned, designed, researched, evaluated, and prepared teaching materials together; and (d) teachers taught others the practice of teaching. Based on Little's characteristics, professional development aligns with the goals of professional learning communities. Similarly, Little, Horn, and Bartlett (2000) stated that professional learning communities can lead to improvements in instruction and solutions to issues that can bring about to school reform. Through the implementation of professional development, professional learning communities can lead to improved instruction.

According to Hoaglund, Birkenfeld, and Box (2014), "Teachers benefit from interacting with colleagues to review assessment data, engage in professional learning, and share in planning curriculum. These activities can have a profound effect" (p. 524). Supporting teachers within a professional learning community and focusing on student learning shows participants the value of the community and the importance of belonging to it (Hoaglund, Birkenfeld, & Box, 2014). Teachers who see the value and usefulness of their professional learning community may be more likely to contribute to it.

In Diacopoulos' (2015) study, a professional learning community of social studies teachers met as a group, identified their needs for technology integration, and worked together to implement a technology strategy to improve their instruction. These teachers understood the value of their professional learning community and used it effectively. Diacopoulos (2015) detailed the efforts of a social studies professional learning community as it worked together to "evaluate, select, and successfully trial Web 2.0 applications in their classrooms" (p. 147). The participants of this professional learning community used research and collegial feedback to determine which tool to use and adapt it into their lesson planning. The study's participants saw the natural connection between technology integration and professional learning communities. Teachers were able to use the technology to plan teaching materials together and evaluate the outcomes of their implementation as a group. This improved both their understanding of technology tools being integrated, and their cohesion as a professional learning community. "In discussion with the teachers in their PLC meetings, they felt that by using and integrating Web 2.0 tools, they were automatically developing their level of knowledge and understanding of technology concepts and operations" (Diacopoulos, 2015, p. 143). In this study,

technology integration was an appropriate addition to the professional learning communities and was useful in improving the practice of teaching.

While there are positive aspects to professional learning communities, disadvantages are associated with them as well. A drawback of professional learning communities can be associated with teacher attrition. Teacher attrition is created by several factors. Darling-Hammond (2003) identified salaries, working conditions, teacher preparation, and mentoring support as some negative influences. Attrition can affect professional learning communities as schools must review information with new teachers who are joining a community that returning members learned in it in the past (Darling-Hammond, 2003). This can cause veteran teachers to become frustrated and disillusioned with the professional learning community, thus limiting their involvement in the community.

For example, Dehdary (2017) found that teachers who had participated in a professional learning community successfully identified attrition as the major reason that their group was weakening. The researcher stated, "The analysis of the data revealed sense of belonging, teacher's view of the profession, infrastructure, and flawed dialogue as the main reasons" (Dehdary, 2017, p. 652). Work is needed to sustain professional learning communities. If the learning community does not show growth or improve, teachers may not see the benefit of participating in it.

Coaching is one way to help professional learning communities grow and improve. Those professional learning communities that follow the guidelines identified by Little's research, in which teachers work collaboratively to increase student achievement and peer growth, can be successful avenues for coaching. The coach in this

type of professional development does not act as a group leader but as a guide for teachers. The coach should help to establish and maintain routines, collect and analyze data, and focus on the goal of student learning (Crawford et. al., 2017).

One-On-One

Coaching in professional development can be done in whole group settings, professional learning communities, and in one-on-one meetings. Like in student learning, an individualized, personal learning approach can be beneficial to inservice teachers, too (Gynther, 2016; Limongelli, Sciarrone, Temperini, & Vaste, 2011; Ma, Xin, & Du, 2018). Targeting teachers' specific needs and areas of weakness with individual coaching sessions can help teachers improve their approaches (Rezzonico et al., 2015).

In a one-on-one coaching professional development model, there is "individualized support that takes into account the practice of the educators and provides feedback either on site within the classroom or via the Internet" (Rezzonico et al., 2015, p. 718). For example, coaches can become more familiar with a teacher's knowledge of technology, comfort level with it, and style of teaching before planning for technology integration. During a one-on-one session, coaches can focus on teachers' specific lesson plans and content area to convey relevant information and provide examples of how technology integration can fit teachers' needs (Desimone & Pak, 2017). Meeting teachers where they are and identifying their needs makes one-on-one coaching a popular form of professional development.

Needs can differ from teacher to teacher. In a one-on-one model, situated professional development can address teachers' needs in their own classrooms and can lead to a coach tailoring learning to meet individual technology, pedagogy, or content

related needs of a specific teacher (Ertmer & Ottenbreit-Leftwich, 2010). Doering, Koseoglu, Scharber, Hendrickson, and Langran (2014) identified that teachers do not need to be the most knowledgeable people in all areas of technology, pedagogy, and content. What they do need is scaffolded professional development in these areas to integrate technology well into their teaching. In Doering et al.'s (2014) study, participants stated that using activities for authentic learning can help teachers integrate technology into their classrooms, regardless of the content or pedagogical knowledge they possess, can increase student engagement and provide real world learning contexts. So, teachers who are willing to integrate technology into their classrooms may need a more individualized approach to implementation.

Whole Group

Professional development can also be done as a whole group or staff, which is most typical. Whole group professional development has encouraged peer collaboration, a beneficial way to encourage and improve experienced teachers' technology integration implementation (Liu, Tsai, & Huang, 2015). Teachers, both experienced and novice, have learned from each other about technology integration and how to create, update, or improve lessons using technology to engage students (Little, 2003). Creating a community of peers, one where everyone learns the same information at the same time, regardless of the grade level or subject area they teach, can help bond teachers and improve a schools' culture. Teachers in group settings also work together to share problems, consider new solutions, and seek advice. Through participation in this practice, teachers have improved their own practice, as well (Little, 2003). In a whole group setting, teachers can gain ideas from peers who work in different grade levels or

content areas who they may not have an opportunity to spend much time with outside of a staff meeting (Desimone & Pak, 2017). Having a larger community to rely on and relate to, regardless of the subject matter taught, can help teachers to support each other in times of need and encourages dedication to their craft (Talbert & McLaughlin, 2002). A larger professional learning network within a school building can be an inspiring and uplifting resource for teachers of all content areas.

In a study about teaching educators about the instruction of English language learners, Shea, Sandholtz, and Shanahan (2018) found professional development in whole group settings to be successful. The researchers reported that when more than 50% of the teachers in a school took part in the same professional development progressive improvement was observed. The study reported that whole group professional provided "teachers more opportunities to engage in professional conversations around their practice" (Shea, Sandholtz, & Shanahan, 2018, p. 204).

One drawback to whole group professional development can be the lack of individual interactions. Failure in this type of professional development comes with "one-shot approaches with little follow-up" (Fenton, 2017, p. 171). To counteract this potential downfall, supplementary support, in the forms of one-on-one follow-ups or small group continuations on the topic, should be offered to the group as a way of including all learners and meeting their needs (Kjaer, Vedsted, & Høpner, 2017). Activities that are offered to all, are implemented over time, and have individual follow-up opportunities are seen by some as the best types of professional development (Lawless & Pellegrino, 2007). In this implementation type, those teachers who feel that they need additional instruction outside of the group should be advised to request it.

Self-Directed Learning and Self-Efficacy

Some educators do not need formal professional development sessions. Teachers who learn a topic, find it interesting, and learn more about it on their own are also taking part in professional development. Mushayikwa and Lubben (2009) defined self-directed professional development as "the professional development arising from the teachers' own initiative, i.e. the process is internally determined and initiated" (p. 376). Zhao et al., (2002) reported that some teachers, who work better independently and rely less on the support of others can find greater success in technology integration. The need for coaching in this type of professional learning may be minimal.

Self-directed teachers who perform their own professional inquiry and explorations do not need the formal coaching professional development as described above. The coaching program described in Veenman and Denessen's (2001) study aimed to "help teachers become more reflective and analytic, more self-directed and more adept at identifying areas for improvement and also implementing improvements in their instructional behaviour" (p. 386). The coaching plan's end goal in this study was to have teachers become more self-directed, thus increasing self-efficacy. Self-efficacy is the "belief in one's own abilities to perform an action or activity necessary to achieve a goal or task" (Watson, 2006, p. 152). Since teachers come to professional development with different experiences, levels of background knowledge, and readiness to integrate technology, allowing them to determine the path taken to implementation can benefit those who feel comfortable in doing their own self-study.

Those teachers who are self-directed and have higher self-efficacy will engage in their own learning about technology. They may participate in formal professional

development sessions without showing any growth from the experience (Watson, 2006). Teachers with high levels of self-efficacy may learn new tools or skills, but their levels of self-efficacy, confidence, or readiness may not show any growth because they were already so high (Watson, 2006) (i.e., a ceiling effect). If they do not have a need for one-on-one or coteaching sessions, coaches can provide these teachers the ability to decide their levels of support. A coach's role in these situations may be to simply be available to enhance teachers' classrooms or provide technical or pedagogical support when needed (Ertmer & Ottenbreit-Leftwich, 2010; Jacobs, Boardman, Potvin, & Wang, 2018; Veenman & Denessen, 2001).

Providing professional development opportunities to teachers in schools is a way to improve teacher performance, knowledge, and skills (Desimone & Pak, 2017; Ertmer, 1999). Identifying which type or types of professional development is right for a school or group can be difficult but involving coaches can help to focus in on teacher needs and build their aptitudes (Ertmer, 1999). Participation in professional development can lead to changes in teacher beliefs and practices for technology integration (Tondeur et al., 2017). Through professional development, teachers' beliefs about technology integration and their perceptions about their own abilities to use it can increase their willingness to implement it in the classroom.

Teacher Perceptions of Readiness for Technology Integration

Teachers must feel ready to implement the professional development they learn into their lesson plans before technology integration will occur (Inan & Lowther, 2010). Not all educators have the confidence or belief that they can successfully implement technology. Teacher perceptions of readiness for technology integration can be

dependent upon several factors including (a) perceptions of their abilities to integrate technology, (b) years of experience in teaching, and (c) exposure to technology in college. (Petko, Prasse, & Cantieni, 2018). Each of these factors is discussed below.

Teacher Perceptions

As was mentioned earlier, teacher readiness to integrate technology included "teacher perception of their capabilities and skills required to integrate technology into their classroom instruction" (Inan & Lowther, 2010, p. 141). Teachers who believe that they have the ability to use technology successfully in the classroom are more likely to. Perception of skills can influence the integration of technology into the classroom. Adams (2005) showed that through on-site professional development, teachers who identified technology integration topics they were interested in and worked in groups to learn about these topics, increasing computer and technology integration skills. These teachers actively worked to include technology into their teaching. In the study's teacher postsurvey, 91% of the participants mentioned that they felt their skills to integrate technology had improved (Adams, 2005). Similarly, Inan and Lowther (2010) found that technology integration was directly affected by teachers' readiness, beliefs, and the availability of technology. They stated, "The higher the value of these variables, the higher the teachers' technology integration" (p. 145). This shows that teachers who feel more comfortable with their skills and knowledge of technology will integrate it into their teaching.

Teachers often draw from past experiences when forming their beliefs of technology integration. Identifying and discussing perceptions of and concerns about technology integration can help to encourage teachers in their implementation (Cox,

2013). Professional development opportunities can facilitate a change in these perceptions and concerns. For example, Kopcha (2012) found that after providing technology integration professional development to a group of teachers for several years, the teachers were still using some of the practices learned in the professional development a year after the study's conclusion. Kopcha proposed that the group "continued to provide … the support and professional development needed to sustain [teachers'] attitudes" (p. 11118). This observation showed that positive interactions with professional development can be a way to influence teacher perceptions of technology integration.

Years of Teaching Experience

Many veteran teachers' perceptions of their abilities to integrate technology into the classroom has a foundation in their years of teaching experience (Ertmer, 2005; Thomas et al., 2015). Years of teaching, not age, has had an impact on technology integration (Inan & Lowther, 2010). One reason for this could be that veteran teachers have set routines and ways of teaching curriculum that can be disrupted when adding technology integration into lessons. Pedagogical beliefs influence technology use in the classroom (Yalcin, Kahraman, & Yilmaz, 2011). Preservice teachers have been exposed to more opportunities to experience and plan technology integration before entering the profession. This can benefit their transition to the classroom (Batane & Ngwako, 2017).

Teaching experience can have both a positive and negative effect on technology integration (Inan & Lowther, 2010). As was mentioned earlier, because inservice teachers have experience in lesson planning, classroom management, and content knowledge, technology integration can help them improve student learning (Hew &

Brush, 2007). Experienced teachers must know well the content and pedagogical methods, as well as ways to use technology to reinforce those methods (Ertmer & Ottenbreit-Leftwich, 2010), which can be used to support learning in the classroom. Veteran teachers' ability to experiment with preestablished lessons and to adjust as they learn more about technology integration can provide them with a foundation for implementation that preservice or novice teachers do not have (Batane & Ngwako, 2017). A higher number of years of experience in teaching does not equate to a high level of readiness to integrate technology, however.

Content knowledge and classroom management skills have also been helpful to experienced teachers, but they do not guarantee successful integration. In a study of three teachers with more than 10 years of experience in the classroom, Cox (2013) found these educators did try to integrate technology but admitted to a level of frustration they encountered during the integration. Second-order barriers were identified as issues for implementation (Hew & Brush, 2007; Zhao et al. 2002). They also reported having had less experience with technology or a later exposure to technology than their younger counterparts as issues (Cox, 2013).

Some experienced teachers have also worried about disruption of classroom routines (Ertmer & Ottenbreit-Leftwich, 2010; Somekh, 2008). Cox (2013) identified that "frustration resulted when teachers saw how technology … could also possibly disrupt higher level goal achievement" (p. 214). Veteran teachers know what to teach and how to teach it. Zhao and Cziko (2001) stated that to use technology successfully in a classroom, "The teacher must believe that using technology will not cause disturbances

to other higher-level goals that he or she thinks are more important" (p. 21). Learning to balance teaching and technology can be difficult.

Due to their strong pedagogical backgrounds, veteran teachers benefit from one-on-one technology integration professional development, how to implement it into their existing lessons, and how to become proficient at technology integration implementation (Ertmer & Ottenbreit-Leftwich, 2010). For example, these teachers may need the addition of a coach to help with managing student behavior when they are implementing a new technology or to scaffold support through the modeling of a technology tool to demonstrate its use in the classroom. Introducing new technology to pre-established routines and lessons can disrupt teachers' confidences and return them to a more insecure state (Hew & Brush, 2007). Without knowing the outcome of the addition of a technology tool to the classroom dynamic, veteran teachers can be more hesitant to use them on their own.

Years of teaching experience as a factor for technology integration has not been consistently reported. Mueller et al. (2008) found years of experience did not impact technology integration. Those teachers who felt confident with the technology were more likely to implement it than those who did not, Mueller et al. reported. They found that attitudes towards technology were a better indicator of a willingness to implement technology than teaching experience. In contrast, Inan and Lowther (2010) found that teacher perception of their capabilities and skills required to integrate technology "had the highest total effect on technology integration" (p. 146). Teachers who have experience in teaching but not in technology integration may not have the readiness needed to implement technology effectively in the classroom.

Preservice Teaching Technology Exposure

Exposure to technology in preservice teacher education can influence a willingness to and an ability for technology integration (Tondeur et al., 2017). Students who learn technology tools in teacher training courses often increase intentions to implement technology into the classroom when they are teachers (Banas & York, 2014; Sadaf, Newby, & Ertmer, 2016). This can lead to an increase in confidence for teachers. Confidence in one's ability to implement technology can be a factor in successful integration (Ertmer & Ottenbreit-Leftwich, 2010; Sadaf et al., 2016). Relevant background knowledge from preservice institutions may be a benefit to new teachers, in this respect. Experiences with technology in teacher preparation courses provide self-efficacy to preservice teachers that can impact their future implementation plans (Banas & York, 2014). Preservice teachers are more willing to try something new in the classroom using technology while experienced teachers rely on their past experiences with technology integration to guide their future attempts either in positive or negative ways (Ertmer & Ottenbreit-Leftwich, 2010). Novice teachers have learned more about technology integration through their training in school and are more prepared than teachers with more years of experience to implement it into the classroom (Inan & Lowther, 2010).

Preservice teachers are often exposed to a number of different technology tools that can be used to aid in instruction (Krause, 2017; Russell et al., 2003). Tablet computers, laptops, and interactive whiteboards are becoming more prominent in classrooms. Through preservice training experiences and student teaching, students who are studying now to become teachers have the advantage of learning these tools and how

they can be used in a classroom before leaving school (Ertmer & Ottenbreit-Leftwich, 2010; Sun, Strobel, & Newby, 2017). For example, preservice teachers have the benefit of watching modeling of technology implementation by professors and cooperating teachers during their university clinical experiences. Once preservice teachers are inducted as inservice teachers, they will have a better knowledge for how technology tools work and can be applied to student learning (Sun, Strobel, & Newby, 2017). They may also have an existing knowledge of how technology can support student learning that inservice teachers may not have started their careers with (Banas & York, 2014). According to Cullen and Greene (2011), preservice teachers' comfort with technology improved attitudes and usage of technology in the classroom. Preservice teacher training can increase the self-efficacy and background knowledge of new teachers when they leave their university experiences.

Having had a background in technology integration from preservice courses, some teachers may feel more confident in technology integration than those who did not have these opportunities (Banas & York, 2014). Quesada and Dunlap (2001) found a notable difference between preservice teachers and inservice teachers. The researchers asked the preservice and inservice teachers to rate themselves on their use of technology in teaching or learning content. The preservice teachers focused their answers more on how to integrate technology, while inservice teachers focused more on how often they integrate technology. Another interesting outcome of this survey was that preservice teachers rated themselves higher on every question than the inservice teachers. Polly, Mims, Shepherd, and Inan (2010) found the attitudes of preservice teachers who had first-hand experiences with technology integration during their field experiences were

positive towards technology integration. The preservice teachers also integrated technology more in their own teacher training programs. These studies show knowledge of and a confidence in technology integration may lead to increases in implementation.

Providing teachers with technology integration experience in preservice programs can provide them with a better understanding of the benefits of implementation on teaching and learning (Kurtz & Middleton, 2006; Lei, 2009). Russel et al. (2003) observed that inservice teachers and preservice teachers both believed in the positive impact technology can have on student learning. Those teachers who did not have preservice technology integration experiences may see the benefits of integrating technology but may not integrate it (Tsai, 2015). Preservice teachers who are able to observe the impact of technology integration on student learning are more likely to implement it in their own classrooms. However, the perceptions and beliefs of preservice teachers does not guarantee its implementation.

Conversely, preservice teachers' general exposure to and experiences with technology still may feel uncomfortable integrating it into their inservice classrooms. For example, Lei (2009) asserted that it should not be assumed that preservice teachers who grew up with technology will automatically integrate technology when they become teachers. Novice teachers are still less experienced and are attempting to successfully combine technological, pedagogical, and content knowledges (Baran, Canbazoglu Bilici, Albayrak Sari, & Tondeur, 2019; Wang, Schmidt-Crawford, & Jin, 2018). Some preservice teachers do not feel comfortable integrating technology or managing it in the classroom due to the possibility of minimal experiences using it when in their methods and technology courses (Banas & York, 2014).

Another reason preservice teachers may begin their teaching careers wary of technology integration is because, as Russel et al. (2003) stated, preservice teachers entering the classroom as inservice teachers can have a stronger belief about "negative effects of computers on students" (p. 308) than veteran inservice teachers. In some cases, there are preservice teachers who grew up with technology, use it personally, but fear it will negatively impact learners or that technology integration would be too hard to integrate into their classrooms (Lei, 2009; Raphael & Mtebe, 2017; Russell et al., 2003). For example, new classroom teachers may be personally familiar with and comfortable using technology but do not have the training necessary to see the value in its implementation (Russell et al. 2003). Familiarity with technology is not equal to usage of technology when it comes to classroom integration. Preservice teachers who are comfortable using technology for social or entertainment purposes may not be as secure with implementing it into the classroom.

Through professional development, teachers with years of experience but less familiarity with technology can improve their confidence levels and willingness to implement technology. Perceptions of abilities from past experiences can be improved upon or changed with practice and support. Teachers who are new to the profession but comfortable with technology integration can also find support from professional development in the day-to-day management of technology and with new ideas and tools to try. Perceptions of ability, years of experience, and exposure to technology can shape a teacher's view of technology integration but these factors do not have to limit it.

Chapter Summary

Technology integration refers to teachers' use of hardware and software tools effectively and efficiently in the classroom to enhance student learning. The readiness of teachers to integrate technology into the classroom can be a significant factor in the success of a school's implementation. Readiness can be reflective of first-order and second-order barriers teachers face within the schools. Also, readiness can be determined by past experiences teachers have had using technology and the education they have received on the topic. Professional development can be used in several forms to help teachers become more ready to integrate technology. Coaching and coteaching, professional learning communities, one-on-one sessions, whole group meetings, and self-directed learning opportunities can all be used by coaches to improve teachers' knowledge of technology and their comfort with integrating it. The effect of coaching and professional development on teachers' levels of readiness can be shown in their willingness to try new technologies and their own perceptions of readiness to integrate technology. Perceptions of readiness can dictate some teachers' use of technology in the classroom. Those who feel their skills in the area are lacking may not be as willing as others who feel confident. Teachers who have been in the profession for some time can become comfortable with the ways in which things have always been done. There is the possibility for those who have little experience with technology to shy away from it or reject its use. Conversely, newer teachers may be more willing to embrace a technology rich classroom. Coaches can help both levels of teachers integrate technology effectively to enhance student learning.

CHAPTER 3

METHODS

The purpose of this action research was to evaluate the implementation of a technology integration professional development program for teachers who were new to the Ocean County School District. Three research questions guided this research.

1. How does a technology integration professional development program impact teachers' perceptions of readiness to integrate technology within the classroom?
2. How does instructional technology focused professional development remove teachers' barriers to integrate technology in the classroom?
3. Based on data collected during implementation, how do new district teachers respond to technology integration support?

Research Design

This research was performed as an action research study. It was conducted in conjunction with my role as an educational technology coach in the school district (Mertler, 2017). Action research was the appropriate approach for this topic because this methodology allowed me to gather data about how professional development for technology integration was done at a specific school. As a certified teacher, I was able to implement the action research portion of my study while engaging in my role as an educational technology coach with the classroom teachers involved in the study. The duality of my roles allowed me to make connections with the participants and work with them in a nonevaluative way. I conducted the research as a way to help the teacher-

participants in the study improve or refine their practice (Sagor, 2000). The action research process was a valuable because it allowed me to both conduct research on the topic while taking action to improve or change the process as I went.

Action research is a practitioner-based, systematic study to provide the researcher with results that can affect her practices (Mertler, 2017). The action research process has seven steps. These are (a) selecting a focus, (b) clarifying theories, (c) identifying research questions, (d) collecting data, (e) analyzing data, (f) reporting results, and (g) taking informed action (Sagor, 2000). Through action research, I was able to follow each of these steps and focus on a topic that was valuable and meaningful in my own teaching. This type of research made me a more effective and reflective teacher and coach.

This study used a triangulation mixed-methods design of data collection. Both qualitative and quantitative types of data were collected and analyzed to better solve the research problem. A triangulation mixed-methods design allowed me to collect qualitative and quantitative data at the same time and equally use the strengths of each to corroborate findings when analyzing results to better understand the research problem (Mertler, 2017). Using a combination of these data collection methods, a thorough understanding of the impact of implementation of technology integration support was realized through triangulation. These data provided specific ideas from participants, as well as statistical information from questionnaires that can help to improve implementation and evaluation of the program.

Action research was beneficial to this study because it provided for the monitoring and adjustment of the study as it was happening. With this method of research, I was able to collect multiple and diverse types of data to create “a more

complete understanding of a research problem than either quantitative or qualitative data alone" (Creswell, 2014, p. 48). An action research study allowed me to learn from the participants in a general way. After the data were collected, I took the information gathered and distilled it down into specific questions for participants to answer. Through this method, I was able to tailor the data collection to what Creswell (2014) describes as the "*what* and *how*[emphasis added]" (p. 39). This helped me make my questions more specific and appropriate for my participants and the study.

Within the final stages of this process, I used the outcomes of the study to help improve technology integration in the classrooms I observed as well as in the rest of the school district (Hine, 2013). Sharing my findings with the administration of the school I used for my research, as well as the rest of my educational technology team will help to increase understanding and awareness around this topic. Since action research was research conducted in a way that may directly impact a school, I think that the outcomes of this study will be beneficial to the school and district involved in the future (Rubin & Jones, 2007). This study showed a direct impact on the school environment in one immediate way. The results from this study can be used in the design process for the next professional development implementation cycle.

Setting and Participants

Setting

This study took place at a middle school in the southeastern United States. Its focus included grades 6 through 8. This school had just over 1,000 students enrolled at the time of the study, and it employed more than 90 staff members. The school did not qualify for Title I status. It was an International Baccalaureate (IB) school. Technology

was a large part of the IB program, and it was a focus of the school's professional development plan for the year. About 20% of the staff at this school had been employed there for five or more years. Turnover at this building had been high for several years, bringing with it a lot of teachers who were new to the school district.

Technology was easily available to teachers and students at the school. Each teacher had been given a laptop to use for instruction and each classroom had been outfitted with a new Boxlight panel, an interactive white board. Each student in the building was also provided with a new HP laptop for school use. Integrating technology into the classroom, using the tools provided, became a priority of the school's teachers and its principal.

At the time of this study, the principal of the school was new to the position. She had recently been transferred from another school in the district to this one by the superintendent. This principal had been a teacher and an assistant principal at this new school several years before. She was familiar with the history of the school, the makeup of the student body, and well known in the community. She was also very interested in the integration of technology into teachers' lesson plans and eagerly gave me permission to conduct my research study at the school. As her last school was granted STEM certification the year before by AdvancedED, the principal told me she wanted to achieve this accomplishment at this new school, too.

The principal and I created the year's schedule of training dates and tentative topics during a meeting in August. This school traditionally had monthly technology professional development sessions during the teachers' professional learning community meetings. The principal wished to continue these meetings. We decided that during

these professional development sessions, the teachers would be shown new technology tools or features that could be integrated into their classrooms. Tools that focused on data collection, student engagement, and productivity were the ones the principal requested the most training on. The principal informed the staff that if any additional topics or trainings were needed or wanted, they could be added to the schedule. Teachers were encouraged to ask for training they wanted, as the schedule was preliminary, and it could be adjusted if needed. As the sessions would be mandatory for teachers to attend, the principal wanted to make sure that the teachers were interested in what would be shown.

Before this school year, the professional development process at this school was similarly provided during a monthly technology session. The topic of the professional development session was decided in advance by a technology coach and the assistant principal who supervised technology for the school. The topics were chosen based on what other schools in the district were focusing on, what the assistant principal felt was necessary for teachers to learn about, or a topic the teachers requested in advance. Attendance at the professional development sessions was mandatory, and the sessions were held during grade-level professional learning communities. For attending, teachers were given an hour of recertification credit. This, too, stayed the same in the current year. Those teachers who missed the session, for reasons such as parent conferences, absence, or the like, were not asked to make up the meeting at another time, schedule a one-on-one meeting, or learn the topic presented on their own. After the monthly professional development sessions, there was no follow-up for teachers with the technology coach about the tools or information that was demonstrated, nor were the teachers required to use the tools or integrate them into lesson plans.

The integration of technology into lessons was not a top priority at this school during the past year. Teachers and students were disillusioned with the laptops students were given to use. The durability and dependability of these devices were low, causing teachers to become resistant to plan lessons that integrated technology. Students were often in class without devices, due to broken tablets, leaving the tablets at home, or the laptops having a lack of charge. Teachers were expected to have an alternate lesson planned for those students who did not have technology available to them in class. In conversations I had with veteran teachers, they related that the large number of students without devices made teachers at the school feel that creating a lesson plan with technology included in it was not an effective use of their time. When the technology was available, some teachers allowed students to use laptops for listening to music or occupying themselves online after completing an assignment. Some of these teachers were not using the devices for lessons, just as a way to keep students busy when they had completed their work. Administration did not stop these behaviors, in the past, as they were aware of teachers' frustrations with the poorly functioning devices. They also knew that students would be getting new laptops for the 2018-2019 school year. The administration did not want to force teachers to use a device that functioned poorly and would not be used in the future. This made some teachers feel, they said, that technology integration was not a focus of the administration. The current principal was invested in student achievement and advancement. She wanted each student to have a working laptop that was used for the completion of work each day.

When this study was performed, the students in the school all had brand-new devices. These laptops had not been malfunctioning or breaking like the last devices.

The staff and students' overall perceptions of the new devices was more positive than that of the previous devices. The staff and students were tentative, at first, in trusting the new devices. As the year progressed, the positive aspects of the new devices made the staff and students more trusting of them. Examples of positive aspects of the new devices were that students began to bring them to class daily, they did not break as easily, and the devices held a charge for the length of the school day. The better functioning technology students used during this school year aided the teachers in their ability to realize the school's new goal of technology integration.

Participants

Four teachers took part in this study. These participants were certified teachers who were new to the school district but had experience teaching elsewhere. The study began during the spring semester of the school year. Implementing the study in the second half of the school year was helpful because it allowed the participants time to become familiar enough with the school and the district to focus on technology integration.

There were several criteria in place to help determine which teachers would participate in the study. These criteria included that the teachers:

- be new to the school district
- have prior teaching experience
- be from the middle school grade ranges
- be recommended by the building principal based on observational data (formal or informal) he/she collected
- be approved by the educational technology department coordinator

Teachers, too, were able to have a say in their participation. Those who were interested did have to meet the qualifications listed above and choose to be a part of the study. Several teachers were approached to participate in the study, but declined, citing lack of time. Only those teachers who felt they could and would like to be a part of the study were considered. No teacher was made to participate by the administration, technology department, or the technology coach. The four who did participate did so because they wanted to be a part of the study.

Participants were not excluded from the study based on the content areas they taught. Core content area teachers as well as those who taught specialty courses were eligible for and invited to take part in the research study. The decision to use all content areas was made because all teachers at this school needed to implement technology within their classrooms to meet the principal's goal of becoming STEM certified. Gender, race, and age were not factors that were considered in the selection process. As long as the teacher had taught in another district for at least a year and consented to participate (see Appendix A), they were eligible for this study.

Intervention

Background

The intervention for this research was school-based professional development. This professional development was held during grade level professional learning communities, in one-on-one professional development sessions, and through modeling and coteaching of lessons. The components of the professional development included coaching, coteaching, professional learning communities, and one-on-one sessions. These forms of interventions were chosen specifically for the study's school context.

Because the teacher-participants were new to the district, they did not have negative perceptions of the laptops that were previously used. These teachers were starting fresh with new laptops. Their impression of technology integration had not been marred by past experiences within the district. These interventions were put into place as a way to support teachers in many ways for integrating of new devices. Coaching was an important method of professional development because it can encourage teachers to learn new strategies and to incorporate them into the classroom (Coburn & Woulfin, 2012). Coteaching, as an intervention, "encourages teachers to learn from one another before, during, and after enacting their planned curriculum" (Murphy & Martin, 2015, p. 277). Professional learning communities were an important form of intervention because these groups had the ability to enact change and spur improvements (Teague & Anfara, Jr., 2012) when they encourage teachers to take part in a "collaborative culture" (DuFour, 2004, p. 9). One-on-one coaching was helpful in enriching the learning from professional development sessions (Desimone & Pak, 2017) and has been found to help "teachers overcome initial obstacles in learning these technologies" (Sugar, 2005, p. 568). These components are summarized in Table 3.1 with example strategies I implemented. A full description of the professional development program is described below.

Intervention Implementation

During this study, I conducted the monthly whole group professional learning community technology professional development sessions as teachers were accustomed to. After these sessions, I meet with the teacher-participants to review the information given at the professional learning community sessions. During these meetings, I

Table 3.1. *Components of Professional Development*

Components of Effective Professional Development	Operationalizations	Examples of Professional Development Strategies in this Research
Coaching	• "the conceptual foundation of the model embodies content focus, active learning, coherence, and collective participating in ways that meaningfully bolster teacher and student learning" (Desimone & Pak, 2017, p. 5). • "Situated professional development is thought to be a successful approach because it addresses teachers' specific needs within their specific environments. Therefore, teachers gain new knowledge that can be applied directly within their classrooms. However, these approaches can be challenging, especially as it takes more time to individually design technology uses and professional development that cater to the needs of individual teachers" (Ertmer & Ottenbreit-Leftwich, 2010, p. 273).	• I will work with the participants to plan lessons that integrate the targeted technology tool. • "Teachers can develop confidence by hearing about or observing other teachers' successful efforts (Ertmer & Ottenbreit-Leftwich, 2010, pp. 273-274).
Coteaching	• Coteaching has been defined as "two or more professionals delivering substantive instruction to a diverse, or blended, group of students in a single physical space" (Altstaedter, Smith, & Fogarty, 2016, p. 637; Cook & Friend, 1995).	• The one teach, one assist model will be used to implement this intervention. I will model a lesson for the teacher one day, and the teacher will teach a lesson using the tools or strategies in the next session.

Components of Effective Professional Development	Operationalizations	Examples of Professional Development Strategies in this Research
Whole Group Professional Learning Communities	• A professional learning community is a community that encourages "teachers to collaborate on their professional work, analyze student data, and assess student learning" (Wilson, 2016, p. 48). Professional learning communities are made up of teacher peers who work in the same grade level or subject area. (Desimone & Pak, 2017).	• I will meet with teachers in grade level groups to introduce new technology tools or resources. The teachers will see the benefits of the tools, how they can be put into practice, and ask questions to clarify understanding.
One-on-one Sessions	• In a one-on-one coaching professional development model, "individualized support that takes into account the practice of the educators and provides feedback either on site within the classroom or via the Internet" (Rezzonico et al., 2015, p. 718).	• I will individually review the information given during the group professional learning communities and provide scaffolding and guidance on how the specific teachers can use the technology tool in their classroom or with their content areas. In a study, Doering et al., (2014) found that teachers do not need to be the most knowledgeable people in all areas of technology, pedagogy, and content, but they do need scaffolded professional development in these areas to integrate technology well into their teaching.

provided any additional information on the hardware or software demonstrated that the teachers asked for, I helped them to design lessons that would integrate the tools into their current units of study, and provided co-planning and coteaching support within the classroom at a later time.

When implementing my interventions, I used the topics and timeline the principal and I had created in August. After dates and topics for the sessions had been finalized, I was able to create presentations that could be used during the professional development sessions and then shared with teachers to use as reference points after the sessions concluded. The topics that were demonstrated for teachers included Flipgrid, Photostory, resources to aid in test review, and online presentation tools. These tools were first shown to the professional learning communities, often organized by grade levels, as a group presentation.

I worked to build upon the traditional monthly professional development sessions for technology integration to create new partnerships with my teacher-participants. In the past, I witnessed these monthly sessions establish strong, trusting relationships among the professional learning community members that help them to support each other as well as the mission and values they were working as a group to achieve (Gallucci et al., 2010). To better my research study, I worked to become more a part of these communities as an educational technology coach. Wolpert-Gawron (2016) writes that a coach "is to offer support and encouragement to help teachers reach their fullest potential, thus having an impact on student achievement" (p. 59). As the only educational technology coach to perform the professional development sessions in this school, I was able to become recognizable to the staff and, in time, a trusted member of their learning community.

As the study progressed, the teacher-participants and I began meeting for one-on-one professional development after their introduction to the technology tool in a professional learning community session. In these individualized sessions, teacher-participants were encouraged to ask questions, discuss how they could use the new tools in their own classrooms, and work with me to create lessons and assessments that could be used in their classrooms and shared amongst their teams or subject area cohorts (Little, 1982).

These one-on-one sessions helped me to target specific needs and to help with approaches to implementation these teachers may have had following the group sessions (Rezzonico et al., 2015). I held these meetings in the teachers' classrooms, so as to provide them with a comfortable and safe environment. The teachers were able to ask any questions they did not ask during the session or new questions they may have thought of since we met as a professional learning community. This one-on-one time was tailored to be what the participants needed to better understand the technology tool and how it could be incorporated into their teaching and lesson planning (Rezzonico et al., 2015). The familiar atmosphere and personalized instruction allowed for richer discussions and more thoughtful implementations of the technology tools.

The first part of the one-on-one meeting provided teachers with the personalized follow-up they may need following the group session. During the second half of the meeting, the participants and I co-planed a lesson using the chosen technology tool for their classes. The transition from one-on-one training to how the tool could be used for coteaching transformed the meeting from an individualized training session to a lesson co-planning session. Through our planning, teacher-participants were able to see exactly

how the technology could fit into the classroom and used with the content being taught (Desimone & Pak, 2017; Ertmer & Ottenbreit-Leftwich, 2010; Hew & Brush, 2007).

The next step in the process was for me to coteach the lessons with the participants. Coteaching the lessons allowed me to help teacher-participants increase their understanding of the technology tool and how to integrate it (Altstaedter, Smith, & Fogarty, 2016). Friend and Reising (1993) identified several coteaching structures. For this study, I implemented the one teach, one assist model. I modeled a non-content specific technology tool lesson for the teachers and students through the lens of a specific content area. The lesson was predominantly about how to use the tool. The teachers were able to observe my lesson and assist me during the lesson, if they wished, providing them with the chance to watch the tool in action and how the students respond to it.

Data Collection

The focus of my mixed-methods research was how teachers who were new to the school district were impacted by technology integration support. I used four collection methods in my data collection. These methods included: (1) pre- and postquestionnaire surveys, (2) participant interviews, (3) classroom observations, and (4) teacher reflections. Each of these is described in detail below. Table 3.2 details the type of data collected, their alignment with the research questions, and how the data was collected.

Table 3.2. *Data Collection Methods*

Research Question	Data Source
RQ 1: How does a technology integration professional development program impact teachers' perceptions of readiness to integrate technology within the classroom?	• Observations • Interviews • Pre- and postquestionnaire

RQ 2: How does instructional technology focused professional development remove teachers' barriers to integrate technology in the classroom?	• Pre- and postquestionnaire • Interviews • Reflections
RQ3: Based on data collected during implementation, how do new district teachers respond to technology integration support?	• Pre- and postquestionnaire • Interviews • Observations • Reflections

Quantitative Data

In this study, qualitative data were collected through questionnaires. Davis (2002) wrote that the importance of a pre- and postquestionnaire is found in that it "provides educators an opportunity to see students' perceptions of their change in knowledge, skills, attitudes, and behavior after participation in an educational intervention" (p. 4). Through the pre- and postquestionnaires, I was better able to understand the perceptions of the participants.

Pre- and postquestionnaires. Pre- and postquestionnaires was used to gather data from participants before the research study began and once it ended. The questionnaire used was the Teacher Technology Questionnaire (TTQ) created by Lowther and Ross (2000). The TTQ was validated by Lowther and Ross in 2000, and its reliability was tested with 4,863 teacher-participants. Reliability estimates were determined to be high for each of the five "subscales of the instrument, ranging from .75 to .89" (Inan & Lowther, 2010, pp. 142-143). From this data, I was able to describe teachers' perceptions of their skills using technology.

These questions were appropriate to the subject matter I was studying and provided clear and noticeable pre- and postquestionnaire data for analysis. These

questionnaires were completed and returned to me electronically, thus, allowing me to collect a large amount of diverse data quickly (Mertler, 2017). The pre-questionnaire provided a baseline of data about the new teachers, in terms of technology integration. The postquestionnaire measured and helped to identify their perception of growth or, possibly, the lack thereof. Through this data collection, the change in perceptions and knowledge was able to be seen and analyzed.

The TTQ has been used often to support research. The first section of the questionnaire asked participants about their demographic information, including gender, age, and ethnicity. The next section posed 20 statements for the teacher to evaluate. Five specific areas were the focus of these statements, all of which dealt with technology integration. These areas were teachers' beliefs, teacher readiness, overall support, technical support, and technology integration (Inan & Lowther, 2010, pp. 142-143). A five-point Likert-type scale was used to determine answers to these questions with 1: Strongly Disagree, to 5: Strongly Agree. Some questions that were included in these questionnaires dealt with topics such as:

- identification of what technology integration skills they brought to the classroom.
- definition or description of changes that they found during the study.
- perception of their own abilities to integrate technology into the lessons.

The final section of the questionnaire asked participants about computers. It inquired about a teacher's personal usage, the availability of computers for student use, as well as the availability of computers within their classrooms.

Qualitative Data

Qualitative data collection happened in three parts. Teacher-participants took part in semi-structured interviews, observations, and participant reflections. These data provided the study with in-depth information that would not have been found in quantitative data alone. The inclusion of participants' verbatim speech, as well as their reflections on the lessons helped to better express the teacher-participants' thoughts about the professional development sessions, as well as the integration of technology into their lessons.

Individual teacher interviews. The data gathered from quantitative surveys were helpful in learning about the teacher-participants' perceptions and knowledge about technology integration. The data gathered from individualized interviews, however, offered more and different information on perceptions and knowledge than the data gathered through my quantitative research (Hew & Brush, 2007). Using interviews, (see Appendix C), data were collected from teachers to learn more about their personal and emotional perceptions of technology integration (Ertmer, 2005; Thomas et al. 2015). Interviews were a helpful resource in this study because they gave me the chance to ask probing or clarifying questions after participant responses that would not be possible in a questionnaire (Mertler, 2017). With this data, I was able to learn more about how the implementation of technology support was resonating with teachers and what changes or improvements could be made in the implementation and professional development procedures.

Teachers who participated in this research were interviewed twice during the study, once at the beginning and once at the end. These interviews lasted between 30 –

60 minutes each, and they were conducted one-on-one. The interviews took place in the teachers' classrooms. This helped to alleviate any situational or locational stresses the teachers might have had during the interviews. The interviews were semi-structured in nature, as I used open-ended, pre-prepared questions, as well as follow-up questions that aided in gaining more information. I felt this was a good way for me to gain the qualitative data that I need, without making the interview feel too formal (Mertler, 2017).

These interviews were audio recorded and transcribed. There were some questions asked that focused on teachers' perceptions of technology skills, competence with using technology, and with integrating it into lessons during each interview. Table 3.3 shows the alignment between the interview questions and the research questions.

Table 3.3. *Research Questions and Interview Questions Alignment*

Research Question	**Interview Questions**
RQ 1: How does a technology integration professional development program impact teachers' perceptions of readiness to integrate technology within the classroom?	• How comfortable do you feel when using technology in your classroom? • How has technology professional development impacted your feeling of readiness to use technology in the classroom? • What are your thoughts or feelings about technology integration?
RQ 2: How does instructional technology focused professional development remove teachers' barriers to integrate technology in the classroom?	• What prevents you from using technology in your classroom more than you do currently? • Can you tell me about a time you were successful in implementing technology in your classroom? • Can you tell me about a time when you were not successful in implementing technology in your classroom? • What are your top 2 or 3 technology tools or pieces that you like to use and how did you become familiar with them?

Research Question	Interview Questions
RQ3: Based on data collected during implementation, how do new district teachers respond to technology integration support?	• What could be done to help you improve your integration of technology into the classroom? • How ready do you feel to integrate technology successfully into your classroom? • What are your thoughts or feelings towards technology-based or technology-focused professional development? • What is a positive and a negative aspect to technology in the classroom? • How often do you use technology in your classroom? • What impact, if any, do you think professional development has on technology integration?

Teacher observations. Teacher observations were an important part of this research study. These data were used to provide notes and qualitative data that lent credibility and authenticity to the study. As the researcher, being able to see the participant using technology in a lesson, and watching how the integration was implemented, provided data that would not have been readily available with a questionnaire or interview. Through observations, I watched the teacher-participants' usage of technology and record what I saw taking place within their rooms (Mertler, 2017). Careful observation and systemic notetaking provided the study with more nuanced data that had a real impact on the study's findings.

I conducted two observations per participant during the research study. Each observation lasted the length of one class period, roughly one hour. Observations were video recorded for transcription purposes. Students were not the focus of these recordings. I used my observation protocol during the class period to make notes, but the

videos helped to make sure that I was able to document everything I need for my research. The video recordings were helpful because I wanted to be able to act as a participant observe and to accommodate the teachers and students as a tech coach while still being able to make notes from my observation.

I used the *Looking for Technology Integration (LoFTI)* as the observation protocol (see Appendix D; The William & Ida Friday Institute for Educational Innovation, 2010). "The instrument captures information on the classroom environment and student grouping, student engagement, hardware and software tools in use, how teachers are using technology" (Oliver, 2010, p. 50). Through this instrument, I was able to document what technology was used in the classroom and how it was used by the teachers.

The observation process took place during the implementation of technology integration by the teacher-participants. I acted as both a researcher and technology coach during these observations. As a technology coach, I provided the necessary training, co-planning, and modeling options that would happen in a coaching cycle, as well as an extra set of hands and a resource during the lesson. After the gradual release method had been put into action, I transitioned from coach to participant observer. Mertler (2017) states that in this role, "the researcher continues to observe and take notes on what is observed but also has the opportunity to interact with the participants in the study" (p. 96). The semi-structured style of this implementation gave me the ability to be adaptable in my research, while still allowing me to provide guidance and assistance as needed (Mertler, 2017). "The degree to which the researcher involves himself/herself in participation in the culture under study makes a difference in the quality and amount of

data he/she will be able to collect" (Kawulich, 2005, p. 8). Through my involvement in the class as a coach, and the work I did before the lessons with the teachers through co-planning, I was able to better understand the culture of the classroom, while not completely becoming a part of it. This helped to inform my research, as well.

In my observations, I looked for how the teacher introduced the technology tool to students, both the body language and words used, as well as the reaction of students to the tool. I was able to note how the teacher answered the questions students asked, what his or her demeanor was when answering, and how the students reacted to the answers.

Lesson reflections. After classroom observations had been completed, participants were asked to complete a lesson observation reflection form (see Appendix E). These forms helped to provide feedback on the teacher's feelings and attitudes about the lesson, its successes, and its failures. They were used to add additional information to the data analysis and participant observations.

Reflection also helped in the co-planning and coteaching parts of the research. Mertler (2017) writes, "In order for teachers to be effective, they must become active participants … as well as active observers of the learning process" (p. 13). Reflections gave teachers chances to step back from their lessons and analyze. They were able to assess what went well, what they may need to work on for the next lesson, and what they have learned from this implementation that can be useful in their next attempt.

I did not want the reflections to take up much of the teacher-participants' time. I wanted teachers to be open and honest about their performances. Because of this, I guaranteed the teachers that their administrators would not see the reflection responses.

This helped me to gain the teacher-participants' trust and provide a safe place for them to feel comfortable enough to answer openly and honestly in their performances.

Data Analysis

Quantitative and qualitative methods of data analysis were used with the four types of data sources collected in this action research study. Table 3.4 outlines the research questions, data sources, and methods of analysis to be used throughout the research study. A full description of the quantitative and qualitive data analyses are within Chapter Four.

Table 3.4 *Research Questions, Data Sources, and Methods of Analysis*

Research Questions	Data Sources	Methods of Analysis
RQ 1: How does a technology integration professional development program impact teachers' perceptions of readiness to integrate technology within the classroom?	• Pre- and postquestionnaires • Teacher interviews • Teacher observations	• Descriptive statistics • Inductive/thematic analysis
RQ 2: How does instructional technology focused professional development remove teachers' barriers to integrate technology in the classroom?	• Teacher reflections • Pre- and postquestionnaires • Teacher interviews	• Descriptive statistics • Inductive/thematic analysis
RQ 3: Based on data collected during implementation, how do new district teachers respond to technology integration support?	• Teacher reflections • Teacher interviews • Pre- and postquestionnaires	• Descriptive statistics • Inductive/thematic analysis

The pre- and postquestionnaires results as measured by the TTQ and the teacher observations with the LoFTI were analyzed by calculating the descriptive statistics (i.e., mean, standard deviation). Descriptive statistics helped me to "summarize, organize, and simplify data" (Mertler, 2017, p. 11). Due to the small number of participants, inferential statistics, such as a dependent *t*-test, were unwarranted. Instead, the results gained from the descriptive statistics were used to describe the teacher-participants' perceptions and uses of technology integration.

Qualitative data was gathered and analyzed using inductive analysis. The goal was "identifying and organizing the data into important patterns and themes in order to construct some sort of framework for presenting the key findings of the action research study" (Johnson, 2008, p. 173; Mertler, 2017). Transcripts were created from the teacher interviews, teacher reflections and observational notes. Observer comments from the observations were included in this process. The transcripts for each data type were then coded using Delve, a data coding tool, Microsoft Word, and Microsoft Excel. These codes were placed into categories, as they become apparent, using Delve and Microsoft Excel. Categories were reviewed for patters and combined as needed. Themes were extracted from these different categories. Connections between the data collected and the research questions were then made.

Due to the small number of participants and in-depth data collection, I generated individual participant descriptions that reflected the teacher-participants' experiences and then combined data to generate themes and evidence across all of the participants. I represented all of my findings using narrative text through thick, rich description, examples of classroom practices, and the teacher-participants' own words.

Procedures and Timeline

The procedures used in this study were implemented in phases. In total, there were three phases in the research data collection procedure. The phases are summarized in Table 3.5.

Table 3.5. *Study Procedures*

Phase	Expectation	Time Frame
Phase 1: Participant Identification	• Identify Participants • Contact Participants • Obtain Consent from Participants • Schedule Preinterviews • Prestudy Observations (4)	4 Weeks
Phase 2: Data Collection	• Conduct Prequestionnaire (TTQ) • Conduct Preinterviews with Teachers (4) • Observations of Teachers' Lessons (8) • Teacher Reflections of Observed Lessons (8)	9 Weeks
Phase 3: Data Analysis	• Preinterview Transcription and Analysis (4) • Postinterviews with Teachers (4) • Postinterview Transcription and Analysis (4) • Postquestionnaire (TTQ) • Prequestionnaire (TTQ) Analysis (4) • Postquestionnaire (TTQ) Analysis (4) • Teacher Reflection Analysis (8) • Code Teacher Observation Lessons (8)	5 Weeks

In the first phase, which took about four weeks, I identified the teachers who would take part in my study. This took place in January of 2019. Once the participants agreed to take part in the study, they were given consent forms to fill out. Interview and observation information was included in these forms. Next, tentative times and dates were established for preinterviews (see Appendix B) and for the completion of the

prequestionnaire (TTQ; see Appendix F). Teachers were given as much information about the study as possible during this phase.

In the second phase, which lasted about nine weeks, teachers began their participation in the study by completing the prequestionnaire (TTQ; see Appendix F). These data were collected online through Google Forms. Teachers received a link to the questionnaire in an email and were asked to complete the form online. The next step in this phase was the preinterviews of teachers. As monthly staff professional development sessions were already scheduled during professional learning communities, the teacher-participants and I set up dates to complete their preinterviews with these sessions in mind. Next, the one-on-one sessions and co-planning began. During these sessions, each teacher and I met and spent about an hour together reviewing the information presented in the professional learning communities and planning a lesson that incorporated the demonstrated technology. I modeled the lessons for the teacher-participants during coteaching sessions. During this time, I was able to demonstrate the lesson while the teacher-participants acted as observers. This modeling gave teacher-participants more information on integrating the technology tool, what issues or questions may arise during their teaching of the lesson, and also gave students in the classes background knowledge on the tool being used. This implementation process was repeated for each teacher twice during the study. Overall in this phase, I observed each teacher's lessons twice while using the LoFTI protocol (see Appendix D) to help me track my data. These observations were video recorded on my computer to help with analysis. Teacher reflections were also completed during this phase. Reflections were electronically distributed to and collected from teachers after each observation via links to Google

Forms I created (see Appendix E). These reflections asked teacher-participants to answer questions that helped to identify what went well during the lesson and what did not, providing important feedback to the participants and me, as the researcher and coach.

In the final phase, follow-up data were collected and analyzed. This phase took about five weeks. A postinterview was performed at the end of the study with each participant (see Appendix C). These interviews were audio recorded to aid in the analysis process. Finally, a postquestionnaire was completed at the end of the study to gather data that were compared to the initial results (see Appendix F). These postquestionnaires were collected online. Teachers received a link to the questionnaire in an email and were asked to complete the Google Form online.

Once all of the data were collected, the transcription and coding of the interviews and coding of the observations took place. The pre- and postquestionnaires were analyzed and compared. While the process did span an entire semester, the pacing gave the teacher-participants and me enough time to comfortably and confidently plan and implement lessons that integrated technology into their classrooms

Rigor and Trustworthiness

For the qualitative data, I had additional methods for ensuring rigor, "the quality, validity, accuracy, and credibility of action research and its findings" (Mertler, 2017, p. 321) and trustworthiness, the "verification of the consistency of various sources of qualitative data while accounting for their inherent biases". (Mertler, 2017, p. 322). My goal was to report accurate, credible, and bias-free findings. In this study, peer debriefing, thick, rich description, member checking, audit trail, and triangulation were all methods I used to accomplish this goal.

Triangulation

To ensure trustworthiness of data, triangulation was used. Triangulation, the use of multiple data collection strategies, sources, methods and analyses (Creswell, 2014; Glesne, 2006; Mertler, 2017), was demonstrated in this study through the use of direct observations, semi-structured interviews, teacher reflections, and quantitative data source of a pre- and postquestionnaire. Combining these different types of data allowed for confidence in the findings by corroborating data.

Peer Debriefing

Peer debriefing, using peers to help me reflect on my findings and review my data collection, analysis, and interpretation processes, was an important part of my data collection process. Lincoln and Guba (1985) found that peer debriefing held four general purposes. These were to help the researcher stay away from biases and misunderstandings, to express and test any hypothesis the researcher may have, to reason out the next phase of the implementation process, and to provide an outlet for researchers as they perform their study.

Peer debriefing was completed in several ways. First, I shared some of my findings with a number of the educational technology coaches I work with as I completed the study. Also, the findings were reviewed with the district's educational technology coordinator and the director of educational technology as I progressed, to keep them apprised of my progress. Another type of peer debriefing that I took part in was with my dissertation chair. He reviewed and critiqued my data collection process, analysis, and themes. He asked me probing and thoughtful questions to help me understand my data better. During the data collection process, I also collaborated with members of my

doctoral cohort writing group. This was helpful to me because these student peers were also conducting their own research studies. I was able to interact with peers who were experiencing similar situations to me. These peers were well-versed in the needs and issues on which I was focusing and provided helpful feedback to me. Discussing findings of data collection with my peers at work helped to focus my research and added credibility to the study, as they kept me from becoming partial or biased in my analysis of the research. As it can be easy for a researcher to become too involved in the study, this method allowed for outside observations. Peer Debriefing was a meaningful way to critique my progress while increasing the rigor and trustworthiness of my study.

Being able to discuss parts of my study and the research process with my coworkers, cohort peers, and doctorial advisor was helpful to me. Having others read my findings and analyze my work made my study stronger. Listening to the input of others about how to implement a tool or present a training session made me a better and more prepared educational technology coach. This process was used throughout my study to make my work reliable and unbiased at each stage of the research (Creswell & Miller, 2000). My debriefing will also be conducted with my dissertation advisor and faculty committee.

Member Checking

Member checking occurred at several points during my research study. As this was a way for me to share data with participants in my study to help confirm their quality, I incorporated it throughout (Mertler, 2017). Participants were able to review transcriptions of their reflections and interviews to help ensure accuracy. Participant descriptions and observation descriptions were also provided for teacher-participants to

review. Finally, themes that were found in the observations and interviews were given to participants to read. These steps were taken to make sure that I was transparent with my participants, as well as to make sure that the data collected were accurate representations of what participants were doing during the study and of their experiences in it. Involving the participants in my research process was an important part of creating a trusting relationship during this study.

Audit Trail

During my research study, an audit trail was created through my researcher's journal, observation notes, and interview notes to document my thoughts and procedures. My audit trail provided me with a record of memos, observations, and decisions I made during my research to help me create a trustworthy report after the data collection process was completed. This piece was especially helpful in establishing the trustworthiness of my qualitative research and data (Carcary, 2009). Compiling an audit trail helped me to be more complete and aware of the research notes that I took, the explanations of the decisions I made and the rationale for the activities I used in my research (Carcary, 2009). My research was more transparent due to the addition of the audit trail.

Thick, Rich Description

Thick, rich description was used in reporting the findings of the action research. Included in this were quotations from participants taken during observations, reflections, and interviews. These helped to show the participants' perception of readiness to implement technology integration to the reader. Thick, rich description provided readers with statements and details that help them better visualize and understand the experiences and events being described in my study (Creswell & Miller, 2000). Being able to

describe my work well, using quotes and details from my interventions allowed the readers to understand what was happening in the study lent credibility and reliability to my work.

Plan for Sharing and Communicating Findings

At the conclusion of this study, I plan to share my findings with several audiences. First, the teachers who participated in the study will be able to see the final results of my study. Through member checking, teachers had access to parts of the data I collected that concerned them, but this will allow the participants to see the entire study. I want to make sure that the teacher-participants who took part in the study feel like they benefitted from the research, too. For this reason, reciprocity will be an important part of this study. "The process of theory building should be mutually beneficial to researcher and research group participants" (Robertson, 2000, p. 311) . Once study has been completed, the findings will be discussed with the teacher-participants in an informal one-on-one basis. The participants will be asked for feedback on the final results, and recommendations will be taken under advisement for future studies or implementations.

Administrators and academic coaches at the school will be privy to the results. As the school's principal had to approve the study's participants, there will be no need to guard the identities of the participants. Again, this will not be a formal presentation. I plan to simply reviewing the findings with the appropriate assistant principals, academic coaches and the principal who approved and supported the work in a causal meeting once the study has been provided to all involved.

Finally, I will discuss the findings in a more formal meeting with the district's full educational technology team. The educational technology department meets monthly as

a group, so this would be an appropriate time to review the findings. A more formal presentation, like a PowerPoint presentation, may be used in this situation. This presentation would not identify the teachers who participated in the study, only the grade levels and possibly subject areas the participants were from. The focus of the technology team would be reviewing the study, data and conclusions to evaluate if the study would be appropriate in other classrooms.

Mertler (2017) wrote that "sharing the results—either formally or informally—is the real activity that helps bridge the divide between research and application" (p. 259). I understand the importance of sharing my findings with my participants, educational stakeholders and peers to improve the credibility of my study and the knowledge of my research.

CHAPTER 4

ANALYSIS AND FINDINGS

The purpose of this action research was to evaluate the implementation of a technology integration professional development program for teachers who were new to the Ocean County School District. The research questions that formed the basis of this study were:

1. How does a technology integration professional development program impact teachers' perceptions of readiness to integrate technology within the classroom?
2. How does instructional technology focused professional development remove teachers' barriers to integrate technology in the classroom?
3. Based on data collected during implementation, how do new district teachers respond to technology integration support?

This chapter presents an overview and analysis of the data collected during a mixed-methods action research study. Four teacher-participants took part in this study. These participants were administered pre- and postquestionnaires, took part in interviews, observations, professional development sessions, and reflection surveys. This chapter includes both my quantitative findings and qualitative findings. Included in the quantitative findings is a breakdown of questionnaire results by participant. In the qualitative findings' participant descriptions, participant observations, participant experiences with the study, and themes and my interpretations from my data collection can be found. These findings were used to help accurately answer the research questions.

Quantitative Findings

Quantitative data were collected using the TTQ (Lowther & Ross, 2000) as both a pre- and postquestionnaire for teacher-participants. The published validity and reliability of this instrument were reported earlier. Due to the small number of participants, the internal reliability was not calculated.

The TTQ consisted of three sections. The first section asked participants about their demographic information, including gender, age, and ethnicity. The second section posed 20 statements for the teacher to evaluate. There were five areas of focus for these statements; all dealt with technology integration. Each participant answered questions as to their integration beliefs, readiness to integrate, overall support for technology, technical support, and technology integration (Inan & Lowther, 2010). A five-point Likert-type scale was used to determine answers to these questions with 1: Strongly Disagree, to 5: Strongly Agree. The data gathered from these answers were broken down by participant and grouped into five subscales. These subscales were (1) impact on classroom instruction, (2) impact on students, (3) teacher readiness to integrate technology, (4) overall support for technology in the school, and (5) technical support. The final section of the questionnaire asked participants about computers. Specifically, participants were asked about their personal usage of devices, the availability of computers for student use, as well as the availability of computers within their classrooms. Each participant answered all of the questions on both surveys. The results from the first section were included in the participant descriptions, found in the qualitative data findings section. The results of the second section, which included the 20

questions about technology integration, are provided below. The information gathered in the third section was not included in this study.

TTQ Results by Item

Table 4.1 displays the descriptive statistics for the sections of the TTQ. Overall, the respondents who took part (n = 4) increased their view towards their own readiness to use technology, its use in their classrooms, and the support they feel for its implementation. The teachers rated the five subscales within the TTQ, (1) impact on classroom instruction, (2) impact on students, (3) teacher readiness to integrate technology, (4) overall support for technology in the school, and (5) technical support, using a Likert scale. The scale ranged from 1: *Strongly Disagree* to 5: *Strongly Agree*.

From the administration of the pre- and postquestionnaire, teachers' responses increased in each subscale. In four of the five subscales, the responses increased from 3: *Neither Disagree nor Agree* to 4: *Agree*. One interesting result was for the "Item 17: Teachers in this school are generally supportive of technology integration efforts." In the prequestionnaire administration, this had the greatest variance amongst respondents (SD = 1.09). In the postquestionnaire results, this item still had the largest amount of variance (SD = 0.87), but the mean score for the item dropped from pre (M = 3.75) to post (M = 3.50).

TTQ Results by Participant

Table 4.2 displays the descriptive statistics for each participant in the study (n = 4). It is broken down by subscales. One point that can be made for all of the participants was that each had standard deviations that were zero at some point.

Table 4.1. *Descriptive Statistics for Teacher Technology Questionnaire (n = 4)*

Subscales & Items	**Pre M**	**Pre SD**	**Post M**	**Post SD**
Impact on classroom instruction (Items 14, 16, 18, 20)	4.06	0.66	4.38	0.70
14. My teaching is more student-centered when technology is integrated into the lesson.	4.25	0.43	4.25	0.83
16. I routinely integrate the use of technology into my instruction.	4.50	0.50	4.50	0.50
18. Technology integration efforts have changed classroom learning activities in a very positive way.	4.00	0.00	4.50	0.50
20. My teaching is more interactive when technology is integrated into the lessons.	3.50	0.87	4.25	0.83
Impact on students (Items 3, 8, 10, 19)	3.63	0.70	4.13	0.48
3. The use of computers has increased the level of student interaction and/or collaboration.	3.50	0.50	4.00	0.71
8. The integration of technology has positively impacted student learning and achievement.	4.00	0.71	4.50	0.50
10. Most of my students can capably use computers at an age-appropriate level.	4.00	0.71	4.50	0.50
19. The use of technology has improved the quality of student work.	3.00	0.00	3.50	0.50
Teacher readiness to integrate technology (Items 5, 9, 11, 12)	3.81	0.73	4.44	0.50
5. I know how to meaningfully integrate technology into lessons.	4.00	0.00	4.25	0.43
9. I am able to align technology use with my district's standards-based curriculum.	4.25	0.43	4.50	0.50

Subscales & Items	Pre M	Pre SD	Post M	Post SD
11. I have received adequate training to incorporate technology into my instruction.	3.25	0.83	4.50	0.50
12. My computer skills are adequate to conduct classes that have students using technology.	3.75	0.83	4.50	0.50
Overall support for technology in the school (Items 4, 13, 15, 17)	3.69	0.77	4.06	0.75
4. Parents and community members support our school's emphasis on technology.	3.75	0.43	4.00	0.71
13. Teachers receive adequate administrative support to integrate technology into classroom practices.	3.50	0.87	4.25	0.43
15. Our school has a well-developed technology plan that guides all technology integration efforts.	3.75	0.43	4.50	0.50
17. Teachers in this school are generally supportive of technology integration efforts.	3.75	1.09	3.50	0.87
Technical support (Items 1, 2, 6, 7)	3.88	0.48	4.31	0.68
1. Most of our school computers are kept in good working condition.	4.00	0.71	4.75	0.43
2. I can readily obtain answers to technology-related questions.	4.00	0.00	4.25	0.83
6. My students have adequate access to up-to-date technology resources.	3.75	0.43	4.50	0.50
7. Materials (e.g., software, printer supplies) for classroom use of computers are readily accessible.	3.75	0.43	3.75	0.43

Table 4.2. *TTQ Results by Participant*

Subscale	**Anne**				**Doe**				**Jane**				**John**			
	Pre		Post		Pre		Post		Pre		Post		Pre		Post	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Impact on classroom instruction (Items 14, 16, 18, 20)	4.00	0.71	3.50	0.50	4.00	0.71	5.00	0.00	4.50	0.50	5.00	0.00	3.75	0.43	4.00	0.00
Impact on students (Items 3, 8, 10, 19)	4.00	0.71	3.75	0.80	3.50	0.86	4.25	0.43	3.75	0.43	4.75	0.43	3.25	0.43	3.75	0.43
Teacher readiness to integrate technology (Items 5, 9, 11, 12	3.50	0.50	4.00	0.00	4.00	1.20	4.75	0.43	3.75	0.43	5.00	0.00	4.00	0.00	4.00	0.00

Subscale	Anne				Doe				Jane				John			
	Pre		Post		Pre		Post		Pre		Post		Pre		Post	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Overall support for technology in the school (Items 4, 13, 15, 17)	4.00	0.00	4.00	0.50	2.50	0.50	3.50	1.10	4.25	0.43	4.75	0.43	4.00	0.00	4.00	0.00
Technical support (Items 1, 2, 6, 7)	3.50	0.50	4.00	0.70	4.00	0.00	3.75	0.43	4.00	0.71	4.75	0.43	4.00	0.00	4.75	0.43

This is an interesting point because the questions were not grouped together in the questionnaire.

Qualitative Data and Analysis

In this study, I collected qualitative data from three sources. These included one-on-one in-depth interviews with the teachers who participated in the study, observations of the participants' lessons, and open-ended questions the participants answered in their observation reflections. Table 4.3 describes this data set. This section includes a description of the qualitative data I collected, the analysis of my qualitative data, and participant descriptions, observations, and experiences with the study.

Table 4.3. *Summary of Qualitative Data Sources*

Types of Qualitative Data Sources	Number	Total Number of Codes Applied
One-on-one interviews	8	42
Lesson observations	8	Summarized in text
Participant observation reflections	8	Summarized in participant observations
Totals	24	42

My goal in analyzing interview data was to describe the experiences of participants in relation to the research I was conducting. I wrote descriptions of each of my participants, the observations I completed, as well as my participants' experiences. With these descriptions, I also transcribed the interviews I performed, using an audio recording and handwritten notes I took (see Figure 4.1).

After transcribing each interview, I entered them into an online coding tool, Delve, and began reading them over (see Figure 4.2). The unit of analysis I used for this

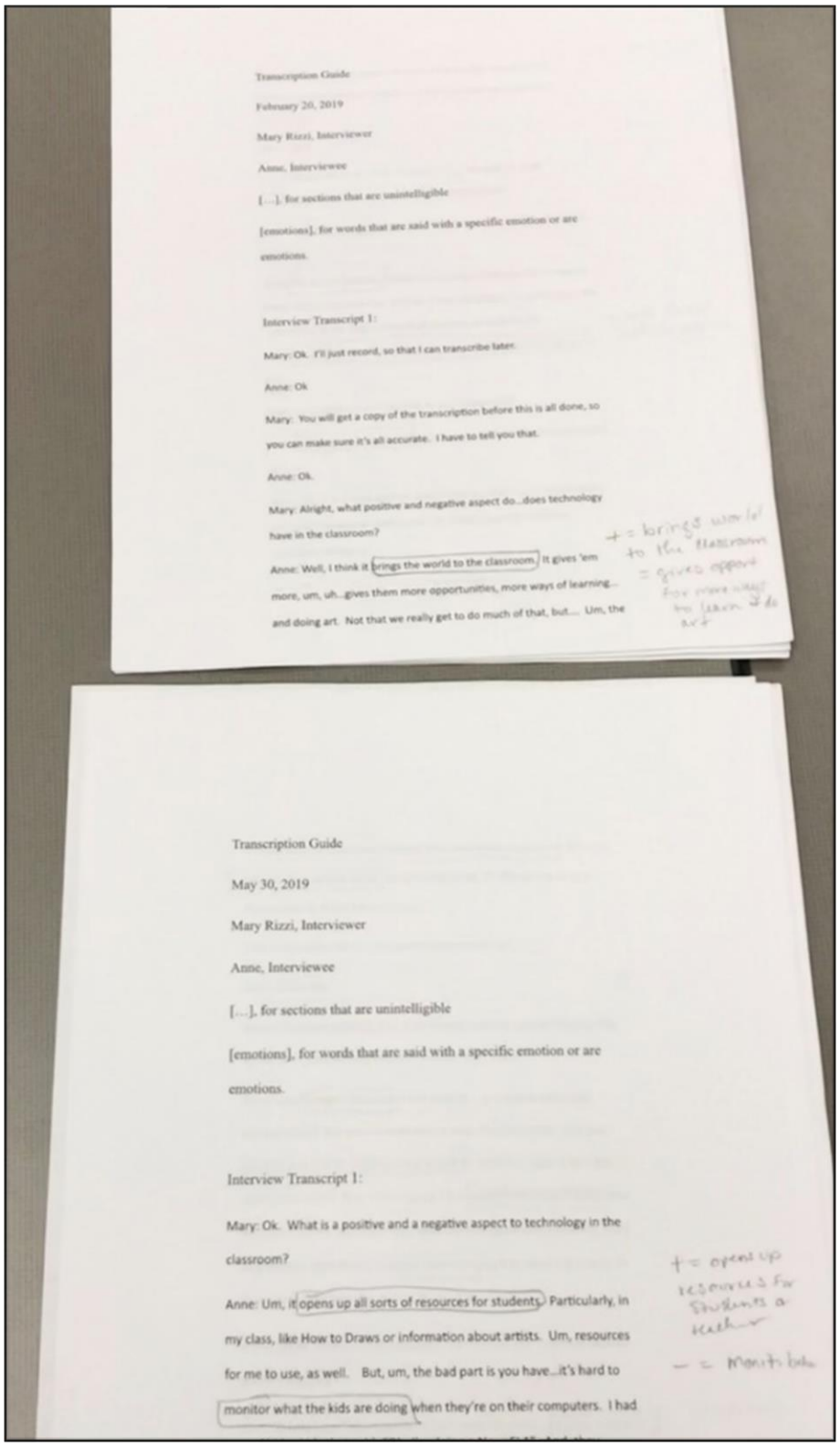


Figure 4.1. An example of transcriptions before online coding began.

process was line-by-line. Using the Delve coding software, I coded my data several times. In the first round of coding, I used different types of elemental coding methods to extract data from my interviews (see Figure 4.3). The types of elemental coding used were Descriptive coding, In Vivo Coding, and Initial Coding. Descriptive coding is one that catalogues the data using plan labels (Saldaña, 2016). An example of this type of code was the *technology tools* code. While it did not last beyond the first round of coding, this code served as a place where all mentions of technology tools were placed in the beginning. This type of coding was used to help me begin to put my data into basic categories. In Vivo Coding is a way to sort data using words that are found in the actual text of the interview (Saldaña, 2016). An example of this type of coding would be the use of the code *overwhelming*. Both Doe and Jane use the word *overwhelming* in their interviews, and *overwhelming* as used as a code. I used this type of coding because I wanted to provide authenticity to the data collection. Initial Coding is a type of coding that separates data into parts, compares these parts for similarities and differences (Saldaña, 2016). An example of this type of coding being used in my data analysis was the separation of experiences with technology use. Both a *positive aspects of technology integration* and a *negative aspects of technology integration* code was developed to help classify the participants' experiences. Using Initial Coding helped to move me on to the second round of coding where I was able to further identify patterns in the data and combine similar categories together. One theme that was eventually created, based on the initial classifications, was *teachers' positive and negative experiences that enable or prevent technology integration*.

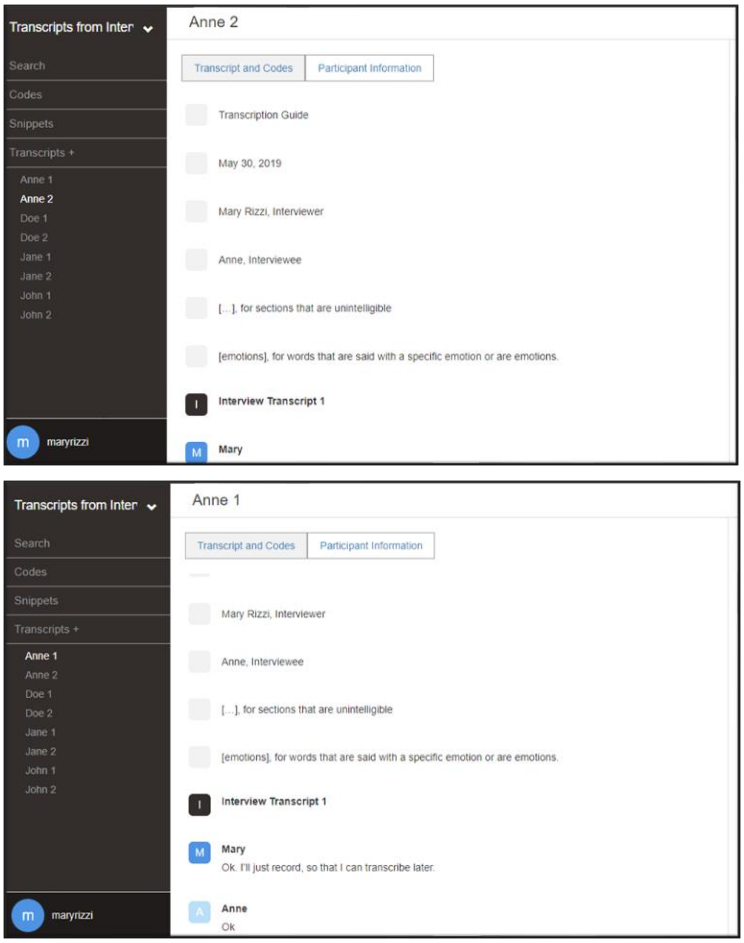


Figure 4.2. A participants' Delve transcripts as the first-round coding began.

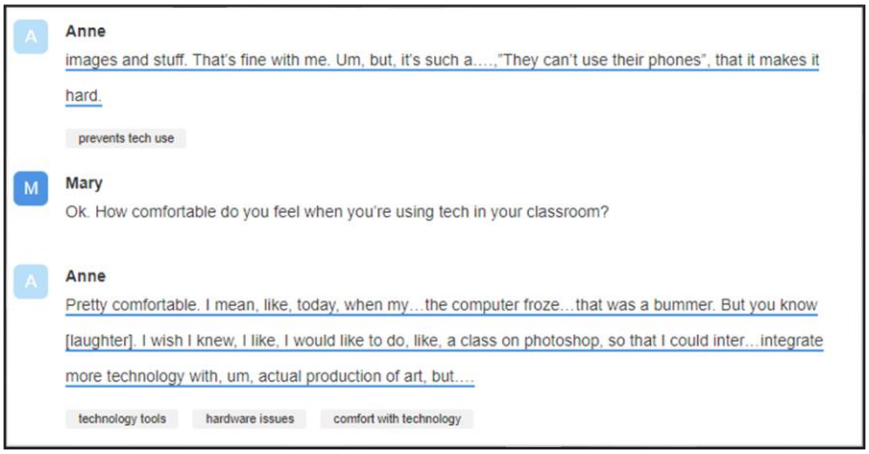


Figure 4.3. A participants' Delve transcript with initial codes.

Using Initial Coding to find similarities and differences in the data showed me when patterns began to emerge. I started to place participants' answers into categories to help me organize my data. Figure 4.4 shows a listing of the categories created during this round of coding. This example shows four of the categories I used. They are labeled, and the participants' quotes are organized underneath them (see Figure 4.4).

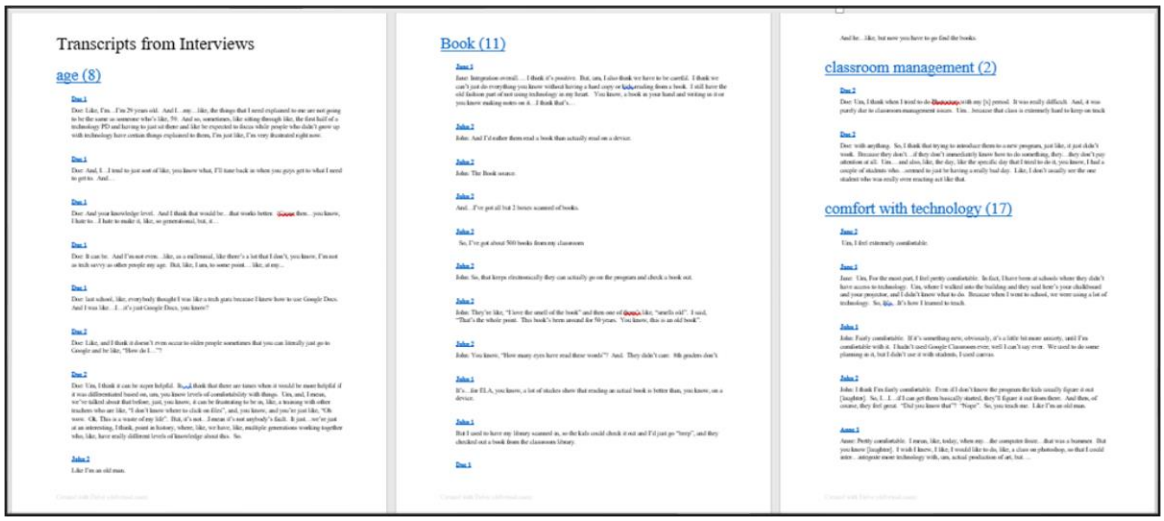


Figure 4.4. Categories that emerged during the first round of coding.

After reading through each transcript and creating initial categories, I began a new Delve project and started a second cycle of coding (Figure 4.5). Saldaña states that second round coding's goal should be to create the beginnings of themes and categories from those identified in the first round (Saldaña, 2016, p. 234). In this round, I worked to organize my data using the information I discovered from the first cycle. I simplified the number of categories I had in this cycle but this caused the categories I did use to become quite large. For example, I created a category called *tech integration*. In this category, I added the round one categories of *tech integration, success with tech, tech PD* and *integration, technology usage, thoughts/feelings towards tech PD,* and *thoughts/feelings*

towards tech integration. When completed, there were 89 entries into the *tech integration* category. As Pattern Coding "is a way of grouping those summaries into a smaller number of categories, themes, or concepts", the larger number seemed like an acceptable outcome (Saldaña, 2016, p. 236) (Figure 4.6).

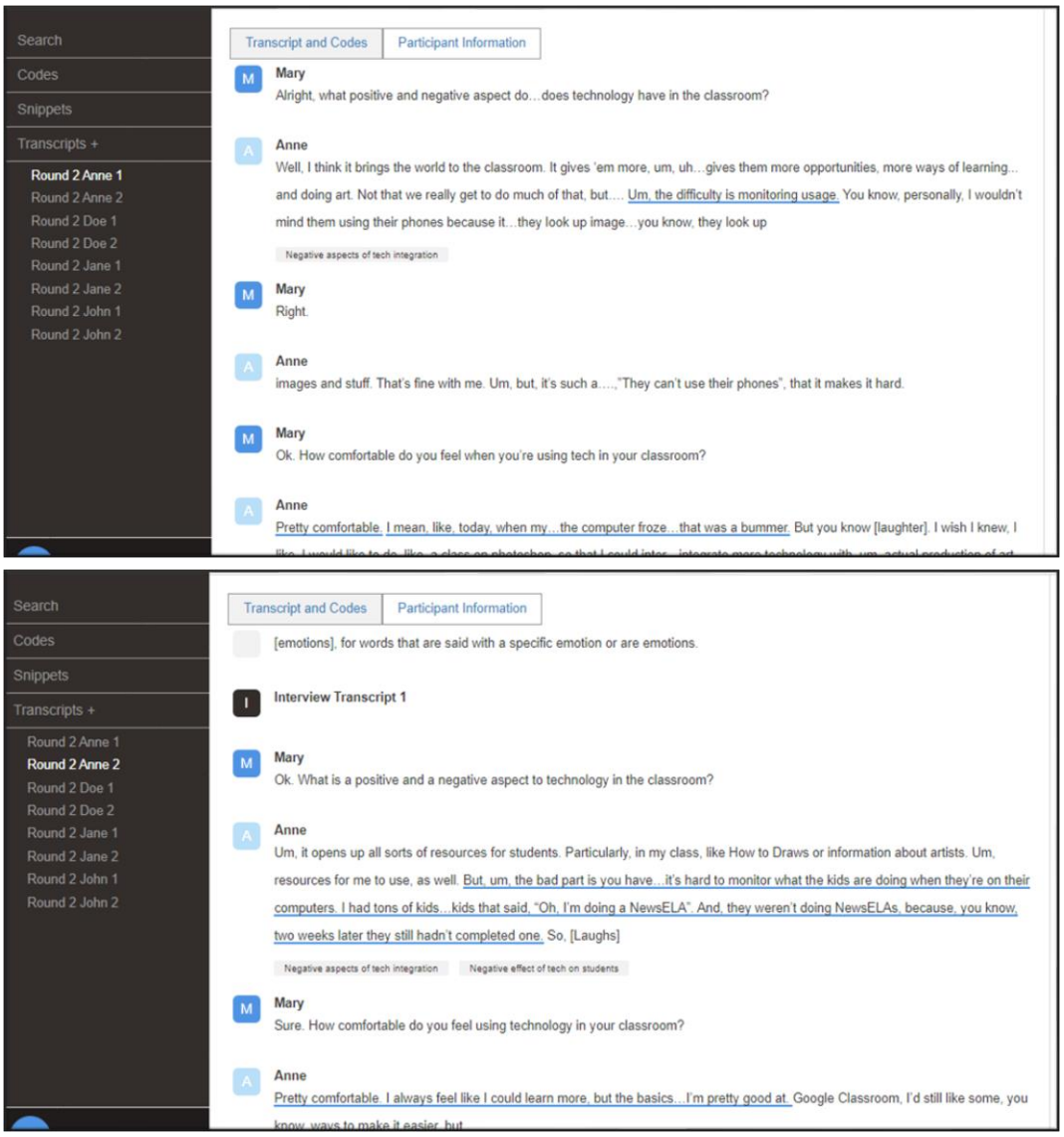


Figure 4.5. Delve images of a participant's transcripts during the second round of coding.

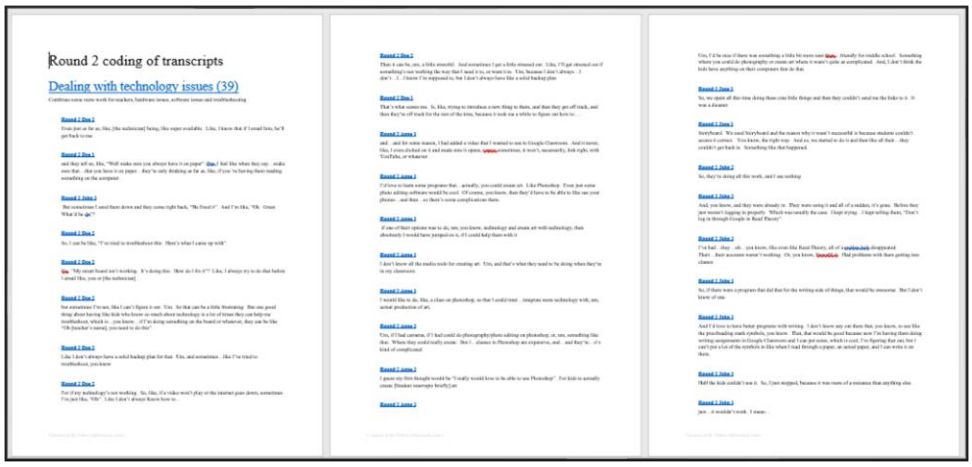


Figure 4.6. Categories that emerged during the second round of coding.

From this simplified but expansive list of codes, I began a third cycle of coding. I merged the thinking behind both the first and second round codes to begin to form themes for my data. In this round, I used Focused Coding. This type of coding identifies the most frequent or important codes to make the most meaningful categories (Saldaña, 2016) (see Figure 4.7).

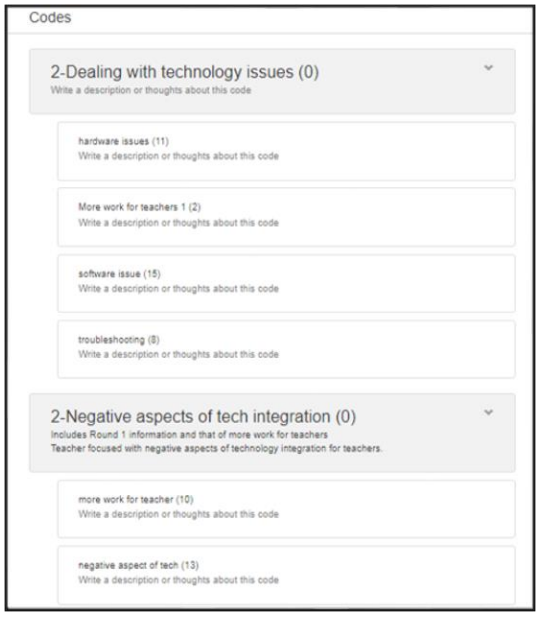
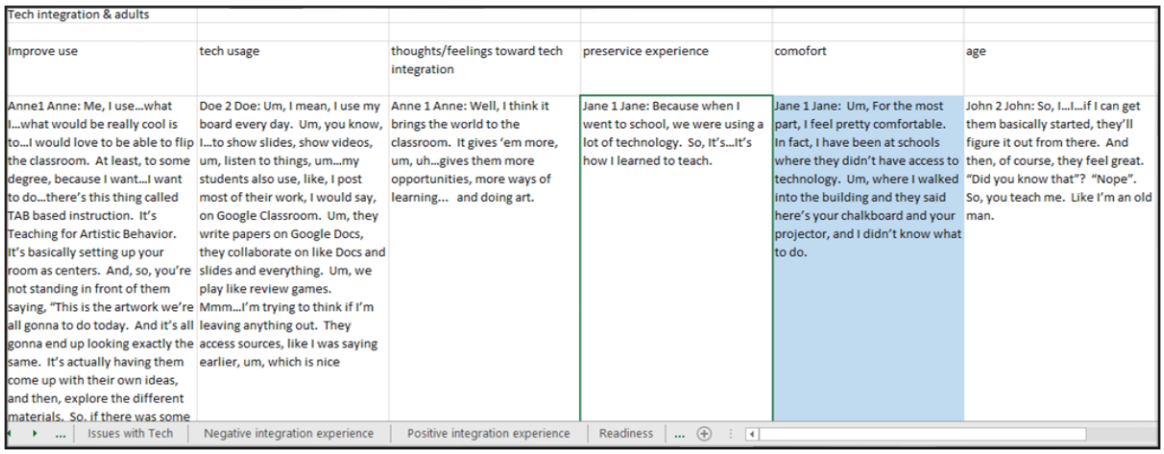


Figure 4.7. The combination of categories during the third round of coding.

Having completed several rounds of the coding process, I began to organize my codes into themes. I created a Microsoft Excel sheet that identified the codes I had identified and the categories that made up each (see Figure 4.8). This could be likened to Axial Coding, in that I was able to connect some categories and subcategories together and determine their relationships (Saldaña, 2016). I had several subcategories that were listed under more than one category during this process.



Tech integration & adults					
Improve use	tech usage	thoughts/feelings toward tech integration	preservice experience	comofort	age
Anne1 Anne: Me, I use...what I...what would be really cool is to...I would love to be able to flip the classroom. At least, to some degree, because I want...I want to do...there's this thing called TAB based instruction. It's Teaching for Artistic Behavior. It's basically setting up your room as centers. And, so, you're not standing in front of them saying, "This is the artwork we're all gonna to do today. And it's all gonna end up looking exactly the same. It's actually having them come up with their own ideas, and then, explore the different materials. So, if there was some	Doe 2 Doe: Um, I mean, I use my board every day. Um, you know, I...to show slides, show videos, um, listen to things, um...my students also use, like, I post most of their work, I would say, on Google Classroom. Um, they write papers on Google Docs, they collaborate on like Docs and slides and everything. Um, we play like review games. Mmm...I'm trying to think if I'm leaving anything out. They access sources, like I was saying earlier, um, which is nice	Anne 1 Anne: Well, I think it brings the world to the classroom. It gives 'em more, um, uh...gives them more opportunities, more ways of learning... and doing art.	Jane 1 Jane: Because when I went to school, we were using a lot of technology. So, It's...it's how I learned to teach.	Jane 1 Jane: Um, For the most part, I feel pretty comfortable. In fact, I have been at schools where they didn't have access to technology. Um, where I walked into the building and they said here's your chalkboard and your projector, and I didn't know what to do.	John 2 John: So, I...I...if I can get them basically started, they'll figure it out from there. And then, of course, they feel great. "Did you know that"? "Nope". So, you teach me. Like I'm an old man.
... Issues with Tech	Negative integration experience	Positive integration experience	Readiness	...	

Figure 4.8. The beginning list of themes and categories.

I edited this list of categories several times. Each version began to show more specific themes with categories that supported them. (Figure 4.9). In completing this editing process, I was provided with a better understanding of the themes and categories that were emerging from my interviews. I was also able to visualize my research better in this format. For example, my first theme "Teachers' persistent issues with technology that prevent integration and cannot be served by PD" (now called Persistent issues with technology that prevent teachers' technology integration), was revised until it contained my *hardware*, *software*, *more work for teachers*, and *troubleshooting categories*.

During this process, I engaged in peer debriefing with my dissertation chair. He asked me a number of questions about my data, the collection of my data, and how and why I categorized them in the way that I did. During this peer debriefing, I was able to explain my thinking when categorizing my data, reflect on the categories I had chosen, and make any changes that I felt needed to be made while thinking about my coding in a different way. This was very helpful to me in finalizing my coding process. For example, I was asked to explain why specific categories were included in the themes that I placed them in. I was able to express my thoughts while evaluating other options during this time. I gained insight on my own thought process, how the coding process might look to an outside observer, and how my themes and categories were organized. I was able to use this debriefing to finalize my list of themes.

My thought process was able to be distilled down to the most necessary topics and meanings during the coding process. In the end, I have five themes, total with 17 categories included in those themes and 9 subcategories (see Figure 4.10). These themes, categories, and subcategories are included, in full, in my data analysis.

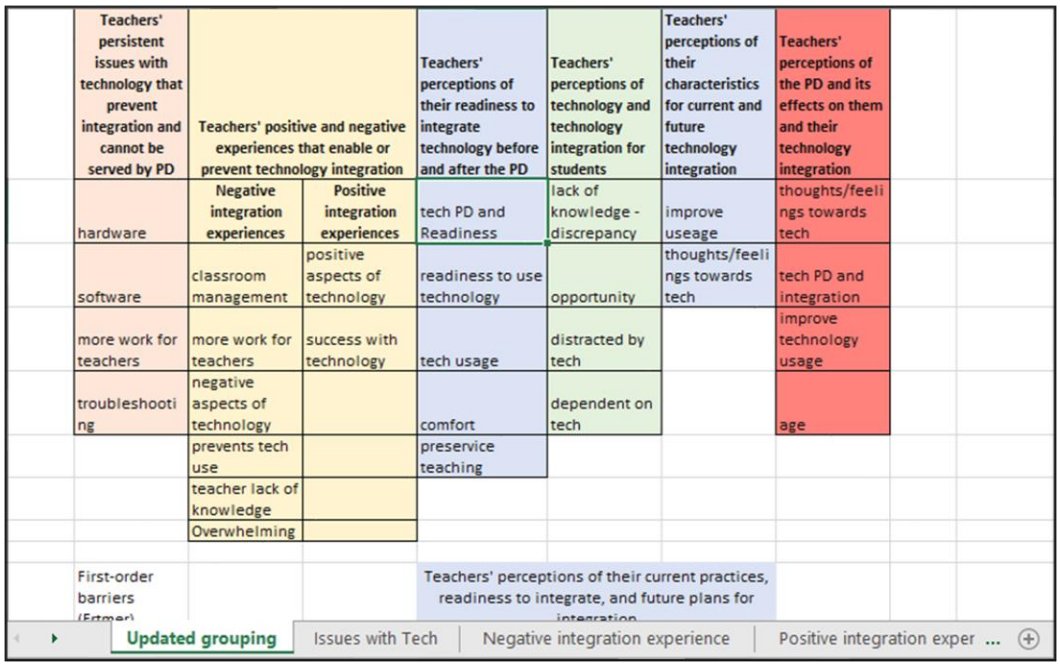


Figure 4.9. A redefined list of themes and categories.

Themes	Categories	Example Evidence
1.) Teachers' persistent issues with technology that prevent integration and cannot be served by PD	a.)hardware	*Anne 1 Anne: I mean, like, today, when my...the computer froze...that was a bummer. But you know [laughter]. *Anne 2 Anne: And there wasn't another plug...there's...you know...there's no more plugs. And, so, I had to just, you know, if you depend on it and you start to depend on it, it... when it doesn't work, that kinda puts a big 'ole monkey wrench in things. *John 2 John: So, if there's something going on with the computer. That'll slow me down, especially for us, and if we're using technology the kids' computers aren't working, you know, like even...like even during testing. John 2 John: sometimes I send them down and they come right back, "He fixed it". And I'm like, "Ok. Great. What'd he do"? *Doe 1 Doe: We're going to do this on paper...because... you know. Um, and it can be, like, it can be tough because, like, if I have parts of the lesson, that are like, "I want you to do this on the computer", and then other parts that are, like on paper, and then, sort of that switching back and forth. And there's...there's just like this always...this drives me up the wall...like, this thing that the kids do where they're like, "My tablet's dead. My charger's at home. I don't know". And I'm like, "You...you're expected to have this. Like, the school provided this for you. You're expected to have this" *Anne 1 Anne: 'Cause, uh, you know, my technology didn't work. And, then, when you've got this kinda plan to show this little 3-minute video, and you spend 10 minutes trying to get the sound to work, and...everything..... Um, that becomes, you know, kind of the bummer. That's the downside to using technology.
	b.) Software	*Anne 1 Anne: I wish I knew, I like, I would like to do, like, a class on photoshop, so that I could inter...integrate more technology with, um, actual production of art *John 1 John: ELA has an awful lot to do. And I'd love to have better programs with writing. I don't know any out there that, you know, to use like the proofreading mark symbols, you know. That, that would be good because now I'm having them doing writing assignments in Google Classroom and I can put notes, which is cool, I'm figuring that out, but I can't put a lot of the symbols in like when I read through a paper, an actual paper, and I can write it on there. *John 2 John: [Laughing] I've had...they...uh...you know, like even like Read Theory, all of a sudden kids disappeared. Their...their accounts weren't working. Or, you know, NewsELA. Had problems with them getting into classes. *Jane 1 Jane: So, we spent all this time doing these cute little things and then they couldn't send me the links to it. It was a disaster. *And, um, I...so I actually even checked it. But, when I went back, it wasn't there. I must not have clicked the "Save" button. You know, I checked the link, but I didn't click that "Save" button, to... *Anne 2 Anne: Um, I'd be nice if there was something a little bit more user frien...friendly for middle school. Something where you could do photography or create art where it wasn't quite as complicated. And, I don't think the kids have anything on their computers that do that. *
	c.) more work for teachers	*Jane 1 Jane: And if they don't bring their technology, then it kind of creates a discrepancy in what they're doing and creates more work for me. *Doe 2 Doe: You know? Like I don't always have a solid backup plan for that. *Jane 1 Jane: When it's on the computer and they've submitted it in 4 different places, I have a harder time just keeping track of it. * Jane 1 Jane: 'and the period number and this'. And then they'll just be all over. And they're like oh I did submit. And I'll be like there's no way you submitted it. I've looked everywhere.

Figure 4.10. The final draft of themes and categories.

Participant Descriptions

This study explored the experiences of four teacher-participants. Each participant was new to the school district, but each had taught in other school districts previously. These participants were asked to take part in the study and agreed. They were recommended by the school's principal, approved by the district's educational technology coordinator, and each agreed to be a part of the study. Each participant completed a consent form at the beginning of the study. These participants were all middle level teachers from several subject areas. They each had their own backgrounds in integrating technology into their classrooms and were beneficial resources to this study. A description of each participant follows with depictions of each participant's observed lessons and their experiences with the professional development program.

Anne (Pronouns she/her)

Participant description. Anne, a teacher in her 50s, came to education in an indirect way. Married in college, she was a dutiful wife for several years. She describes this time in her life as fun, at first. Her husband was a business man who worked in higher education. He networked a lot and she hosted his business clients' wives. She took them to lunch, to the right shops, and arranged evening events for the out-of-town groups to attend. She did what he asked and had a lifestyle that she enjoyed. After several years, however, the lifestyle they were living stopped being fun for her. Upon her divorce, she began working with horses and children at a local farm. Anne enjoyed her work and felt that she was doing something that made her life better. This experience is how she found her way to teaching. Now, Anne has more than 10 years of teaching

experience and is a natural in her classroom. A popular figure in the school, there is almost never a time when students are not in her room.

She moves about her room with enthusiasm during her classes. Students often chat with her as she passes by, asking questions, asking for critiques, or just looking for conversation. During one class period, a student approached Anne to share his work. He was a seventh-grade student who had been creating a woven bag using yarn, and he was excited about it. He wanted her to see how well he was doing. She praised his effort and talked him through the next step in the weaving process. They kept up a casual conversation about topics other than weaving as she showed him what to do. He was working but talking with her, too. He felt comfortable and safe enough to invest in his work and talk about his grades and behavior in other classes with her.

While she is not one to allow students to be off-task, she has a relaxed energy that makes students feel like they can ask her anything and confide in her. During Anne's afterschool art club, for example, a student doggedly asked for a special project that she could work on herself. There was no fear of incurring the teacher's wrath for asking too many questions or embarrassment when looking for Anne's attention. The student knew Anne would help to find a something that would interest her and give her the individualized time she was looking for.

There is an easy comfortability that can be found when in Anne's room. She jokes with the students and they respectfully give it right back. Because of this atmosphere, Anne laughs often; it's a laugh that you can hear from across the room, and it is infectious. At times, it sets the tone for the class period. Students are free to talk, to collaborate, or to sit away from the group and work independently. Technology is not the

centerpiece of this classroom, but it is not avoided, either. In her interviews, Anne states that she uses it daily. She has the students work on traditional art projects, but Anne is willing to try new things, too. She mentioned in her first interview that she would like to integrate technology more in the "actual production of art." She mentioned several times during her interviews she would like to learn more about Photoshop and use this with her students. She felt integrating media arts om would reach students that traditional art may not. Anne also mentioned that she would like to try flipping her classroom. She said,

> There's this thing called TAB based instruction. It's Teaching for Artistic Behavior. It's basically setting up your room as centers. And, so, you're not standing in front of them saying, 'This is the artwork we're all gonna to do today'. And it's all gonna end up looking exactly the same. It's actually having them come up with their own ideas, and then explore the different materials.

She mentioned that she would need to better understand tools like Google Classroom and video creation to achieve this type of integration. While she does not think she is ready to fully integrate this program, Anne said that "ideally, that would be the way I would teach it." Integrating technology is something that Anne is interested in doing but wants to do well.

Observation descriptions. The *first observation I did with Anne* was when she was implementing a tool called Flipgrid into her classroom. She had attended a school-based professional development that included the program and was interested to try it out in her classroom. During the professional development, teachers were shown the program, given an opportunity to create a Flipgrid, and shown how to create and setup a

class of their own. After this, she and I planned a lesson using the tool. Before Anne's lesson, I modeled implementing Flipgrid with one of her other classes. This gave her the chance to see the tool used with students and to ask any questions she had before using the tool herself. When she began her integration of Flipgrid, there were 18 students in the classroom. All of the students had HP laptop devices to use. The classroom was set up so that three long tables formed a U shape around the center of the room. The interactive white board and the teacher's desk were in the center of the room. The inside of the U shape had a table of supplies that students did not sit at, giving Anne room to move from table to table, student to student, to help with their work.

The lesson's objective was for students to use Flipgrid to discuss an artist's statement project that they had created. She had given them specific points that needed to be discussed. This was a new way for students to present their work and submit it for this class. She began the lesson as a whole group, showing the students how to create and submit a Flipgrid by making one herself. The goal was for students to see each step of the process and ask questions as she went through the procedure. Since many of the students were familiar with this tool, the students needed less of a tutorial on Flipgrid and were able to discuss with her aspects specific to their assignment. Anne had prepared well to go through the steps of creating and submitting a Flipgrid but did not have to model the entire process for the class. Instead, she provided individualized attention to the students as they worked to make sure that they were successful in their work.

Students were not overly enthusiastic about this project, and, at first, many complained aloud and to the teacher privately about having to film themselves. These were eighth grade students, and they were self-conscious about their appearance and their

work. One student asked if she could do the assignment at home instead of in the classroom with her peers, another held a picture in front of her face for the entirety of her filming. Other students were allowed to go into the hallway to film their narratives. Anne was very accommodating to the students who showed resistance to this lesson.

While Anne needed some prompts, such as when helping to log students in and when making students' Flipgrids available to be seen by others, she was not shy in asking for assistance, as it helped reluctant students to see that it is OK to take a risk and try something new. Students could see that no one is perfect when using technology, even their knowledgeable teacher. They saw that she was still learning, too, and, for her, that was fine. Overall, I scored this lesson as Amplification when using the RAT Framework (Hughes et al., 2006). Amplification, as defined by Hughes (2019), is when "the tasks stay fundamentally the same while the technology extends our capabilities in effectiveness or streamlining." The lesson was amplified by the use of technology to present and submit a project. While the students could have stood in front of the classroom to display and explain their work, they were able to streamline the process and have all of their presentations on one website for all of the class to view and reflect upon. Fundamentally, the overall objective of a presentation did not change, but the method in which the presentations were created streamlined the process of sharing out projects. All students were represented on the Flipgrid page. Each could present with the click of a button. This was a more effective way to present 18 projects to the class.

Anne seemed to feel comfortable using the Flipgrid in her classroom. After the professional development session and our planning of the lesson, she knew the steps well. When it came time to teach the tool, she seemed ready. She created grids and topics for

her students to use. She was able to discuss the finer points of the tool with students and give them advice and guidance as they completed the project. Anne was very responsive to trying this tool in her classroom.

Anne's second lesson was focused on using games as formative assessment tools to teach and review content. The lesson's objective was to use the game as a way to determine how well students knew their vocabulary terms. She also used the data gathered from multiple rounds of play to identify how much scores increased or decreased between attempts at the game. This is similar to the way the teachers learned about the game during their staff professional development session.

During the professional development, the teachers were asked to play the game without knowing anything about it but the rules. After they played, we discussed their thoughts and feelings towards the game. They were offered the opportunity to try it again. Some groups chose to play more than once, others did not. All teachers, however, did have the chance to see the game from both the student and the teacher point of view. This provided them with the opportunity to understand the setup and gameplay in a more well-rounded way. It also helped Anne to be more knowledgeable and more ready to use the game and answer questions about it as she implemented it with students in her classroom.

Anne and I planned a lesson after school using Quiznetic (now called QuizWhizzer). Several games were discussed during the staff professional development session, so when reviewing the options of which game to choose in our one-on-one meeting we discussed the pros and cons of each. We then focused on planning how we would incorporate one game into her lessons in the upcoming classes. There were two

students in the classroom while we planned the lesson. These students, while not in her classes, were both interested in the games and wanted to play. After our discussion, I hosted a mock game using Quiznetic for Anne and the children so that they could play and see what would happen when multiple players were answering questions and using the settings we applied to the game. Anne was able to decide from playing with students that this was the game she wanted to try and how she wanted her game to be set up.

When the time came for implementing this in the classroom, her class had 18 eighth grade students in attendance. All of these students had their laptop devices with them. None of the students were familiar with Quiznetic, so a priority of Anne's was to teach the rules and procedures of the game as a whole group before the students broke to work independently on the game. This was a difficult tool for students to learn initially. Many struggled with the concept of an online board game, asking questions, specifically, about how they were being scored in the game, how to roll the dice, and why they were taken back a space after missing an answer. Anne was very patient with the students as she explained the aspects of playing the game, earning a score, and how the points were awarded. Students were surprised to find that their computer screens would only hold the questions being asked, while the gameboard and their avatars would be shown on the interactive white board. When the game began, many looked for their game piece on the board before they started playing.

During this game, students answered subject-specific vocabulary questions. They were allowed to use any notes they had taken during previous class periods on the terms and their meanings. The game appealed to students' competitive natures, and Anne was very comfortable stopping to answer questions about Quiznetic and the vocabulary on

which students were being assessed as she walked around the room. The online board game feature of this tool engaged students, and this was a positive aspect overall. Like I did during the staff professional development session with teachers and when I modeled the game for her and students in an earlier class period, Anne use the data collected after the first game to review questions that were most-often missed with students. She pulled up the questions that needed review and discussed them with the students. When she started the second round of the game, Anne and her students seemed more comfortable with the game itself. She needed no prompting with how to start the game over, pick the avatars, or log students in to the game. Students began gameplay immediately, not bothering to look for their game piece. Students had more of a background on the rules of the game and the questions in which they would be answering, thus making them more ready to play the second game. The room quieted down a lot in comparison to the beginning of the first game. Some students pulled their chairs right up to the interactive white board, so as to see their progress on the game board better. Overall, students seemed more focused.

After the lesson, Anne mentioned that this game would be one she would use in the future. One aspect of the game that Anne and I discussed changing in the future was scoring wrong answers. In this game, if students did not get the answer correct, they were taken back one space. This was a point of frustration to many students, but Anne was able to redirect them and encourage them to finish the game. This feature can be turned off, and she said may do that in the future. A positive for the lesson was that Anne did allow students to play the game more than once. This gave students a chance to increase their knowledge of the content and understanding of the game. One unfortunate

part of the lesson was that the scores from the first game did not save because Anne was not logged into the site. She was logged in for the second game and Anne was able to record their scores as a classwork grade.

On the RAT scale framework, this lesson was rated as Amplification. Students were able to replace a physical board game with an electronic version. They were able to play the game several times and show their knowledge without the traditional rules and turns of a physical board game. This was a more efficient and effective way to determine students' knowledge of the vocabulary terms and their areas of weakness with these words before taking a test on the material. The students' scores increased from the first to the second implementation of the game. Anne was able to see some positive results immediately. Since students were able to see their correct and wrong answers as they progressed through the game, they were fixing the information in their notes to reflect the correct definitions and fill in any holes they may have had. This gave them a more complete study guide for their upcoming test. With a traditional boardgame, students would not have had this type of immediate access to the correct answers.

After the introduction of this game during staff professional development, the planning session we had afterschool, and the model teaching I provided, Anne seemed very ready to integrate this technology into her classroom. She was very responsive to trying the game out after our professional development but by the time she started the second game, she seemed to be very comfortable with this tool.

Experience with the study. Anne's experience with the professional development project was different from other participants. While she was open-minded and willing to try new things, like the online boardgame, the topics that were introduced

during whole group staff professional development sessions and the technology used in the classrooms were general tools; these did not quite meet her needs. She did implement some of the tools, like Flipgrid, and another formative assessment tool, Quizizz—both described earlier—that we discussed and planned for another lesson. She said,

> I liked the Quizizz things 'cause it really got the kids, you know, it was so much better than Quizlet. And, um, it's, it was more fun. The kids were in to it. You know, so at least when you give them something that's kind of not creating art […] it's something that they're kinda in to. It's kind of a break in our day.

While not subject specific, Anne was willing to try a variety of tools to engage her students.

Anne found it difficult to use some of the tools from the study in her classroom, because, as she stated, they were not being used "to create art." She was more interested in learning ways that would help students use technology in the creation of art, specifically, with tools like Photoshop. During her interview, she stated that "I don't know all the media tools for creating art. Um, and that's what they need to be doing when they're in my classroom. So, I'd rather them be creating art." Overall, her reaction to the professional development sessions were positive and she was enthusiastic about participating in the study.

As a coach, I found Anne to be entertaining to work with. She was quick-witted and open during our interviews. She was willing to try the tools shown in the whole group professional development sessions. She made herself available to meet for one-on-one sessions, even if there were students in her room. Anne's willingness to learn and

grow was apparent and refreshing. She did not adopt all of the tools we tried, but did try them.

Doe (Pronouns they/them)

Participant description. Doe was in their 20s with five or fewer years of teaching experience. Meeting the needs of the students they teach motivated Doe. Based on my observations of them in their classroom, Doe was very comfortable in their in their content knowledge and with their students. If a student was hungry, there were snacks stashed away in their desk that could be shared. If a student needed to talk, their planning period was a safe time to stop by. If work needed to be completed, students were given ample time to finish their assignments and turn them in. The students were the focus of this teacher's teaching. Because of this, they allowed free seating in the room and had rows set up at different angles to allow students to see each other and the interactive white board. Students could sit where they felt they would best be able to learn. The room, as a whole, was more focused on its center than on the teacher's desk, which was in a corner.

Doe wanted to engage with their students. They wanted to provide options to students in their classroom. Doe was open and available to any issue or question that a student might posed to them. Doe wanted students to think about things in a new way, to ask questions about what they did not understand, and to question what they already knew. While easy going in the classroom, Doe did take issue with teachers who were not willing to try new things or to allow students an opportunity to grow from their learning. For example, this teacher did not discourage cell phone use in class. Instead, Doe saw these devices as an opportunity to teach time management and possibly impulse control.

Doe said in an interview, for example, that if a student wants to use a phone in class to check PowerSchool, their response would be, "You're gonna' check your grades? Ok. Do that after." They did not discourage the use of the phone to complete a task but tried to promote better habits around when and where the device could or should be used. Doe thought teaching students these strategies were life skills. In our first interview, Doe mentioned that some teachers do not like to use technology because they felt it distracted students. Doe, instead, thought this was why technology should be used. Doe was a proponent for modeling how technology could be used in daily life and was "trying to actually teach them how to use technology 'cause just saying it distracts them and not using it is doing them a huge disservice." Doe understood the fear that technology could be distracting but wanted to teach students the skill of using it instead of turning away from it. One way Doe did this was through sharing their own experiences using technology with students. In our second interview, Doe said "I'm open with them about like, you know, 'technology distracts me too'." Sharing this with students and modeling how Doe was able to put technology aside and complete a task was something that students might not have learned in other classes.

In their lifetime, Doe has seen the impact technology has made. Doe started using technology as a teaching tool during student teaching and has become very familiar with the integration of it. Doe wanted to show students that technology can fit into their daily lives, but it has to be used and implemented appropriately. Doe stated that students needed to be told how to use technology and when it was appropriate. Doe was passionate about students having a choice and a voice, even in the area of technology usage.

Encouragement and engagement were paramount to this teacher. Doe made an effort to be well informed about the world, education, and their students. This teacher grew up with technology but was not always confident in the implementation of a new program. During an interview, Doe shared that:

> It's not that I'm not comfortable trying more. It's just that I get kind of in my same way of doing things. I like consistency. Like, even with, like, review, like, I use Kahoot. But, like, I use Kahoot to review all the time.

Being a reflective teacher, Doe realized that there were other options available and resource people who could provide the training or help they may need to implement something new. Doe was open to co-teaching and picked up quickly on the ins-and-outs of new tools.

Observation Descriptions. The *first observation I did with Doe* was using the online formative assessment game Quizizz. When this tool was shown to teachers during staff professional development, a game was played with the staff to explain how it worked on both the teacher and student side. Doe won the game when it was played during their session. Doe seemed intrigued in implementing this tool into their classroom when we met to plan the lesson. As Doe mentioned in the interview, they were hesitant to try new things when what they normally used was working. In our interview, Doe stated they were not opposed to trying new things but liked the consistency of something familiar. In an effort to make Doe more comfortable, I explained that I would teach a section of their courses first, allowing them to watch me model the implementation of the tool and how I used it in my interactions with students. I offered to make the game for Doe, but Doe was excited to create their own. Doe mentioned in their interview that they

were very comfortable with using Kahoot. They noted the similarities between the two games and saw the potential for student engagement and learning that could be found in this new tool, too. We planned a lesson with the objective of using the formative assessment tool to help students review information before a test. The students would have been introduced to the material before the lesson we would present and would have a study guide to refer to during the game. Doe told me that the game would be ready to go when I arrived to work in their classroom.

Doe's classroom was set up in a U shape with the interactive white board on the center wall where all students could see it. Every student in the class had their school-issued laptop, so there was no disparity in access to the technology needed to play the game. Doe allowed students to have free seating during this class, the ability for them to pick their own seats, so there were some conversations happening during the class that was attributed to students sitting with their friends.

When I cotaught with Doe, I played the game once completely through with students. The questions that were used were taken from a study guide that Doe had allowed the students to work on for several days before the review. Students who had completed the study guide had the answers to the questions asked in the game. Those who had not filled out the study guide did not have the answers. The class I cotaught was a high-achieving class, according to Doe. A significant number of the students had completed the study guide and did well in the game. When it was over, I reviewed the questions that were missed with the class. We discussed what the right answer was to these questions and why. The students asked to play the game again. Doe was not

opposed, so we did. The percentage rate of the students' correct answers increased, and this game went well, too.

As Doe started their class, they introduced the game to the 27 students who were in the room. All had their laptops with them, while some had to sit by wall plugs to charge their devices. As most of the students had not played the game before, Doe explained the rules of the game to the class, noting similarities and differences they may find from Kahoot games while students got their devices turned on and logged into the game. The Quizizz game was self-paced, so students were able to begin the game and answer as quickly as they could. Not all of the students in this class had completed the study guide to the extent that the first class had. The students were frustrated when playing, noting aloud that they were not sure of the answers to the questions. Doe spent the game time walking around the room and referred students back to the study guide. When the game concluded, students did not have a high percentage of correct answers to the questions. As I had done, Doe showed students the most missed questions in the game, identified the correct answers to the questions, and explained the reasoning behind the correct answers. Students were encouraged to fill in the answers to their study guides as the review was taking place. After reviewing the answers, students seemed more comfortable with the material. They asked to play the game again. Doe agreed and began it again. As evidenced by cheering and bragging about scores, the students were better prepared to play the game during the second round. The class average was higher this time, and students remarked how helpful the study guide was. When Doe was reviewing the game questions and answers for the second time, students participated more actively in the discussion.

Doe was hesitant to try something new but did well when implementing Quizizz. Doe needed minimal prompting during the lesson and became more comfortable as the class progressed. Doe remarked at the end of the lesson that they would use this tool in the future, based on how well they perceived the lesson to have gone. In their reflection, Doe said, "I think I will definitely use Quizizz in the future. I would like to try it as a pre-assessment as well." They also stated, "I think the technology had a great impact on the lesson's success. Students were more engaged than I have seen them with any other review activity including Kahoot (which is the game we usually use)."

Overall, I scored this lesson as Amplification when using the RAT Framework (Hughes, Thomas, & Scharber, 2006). This technology increased the effectiveness of the game that could have been played aloud or on paper. Students were able to see in real-time their answers, the answers of their peers, and the correct answers to the questions being asked. Percentages of how many students answered questions correctly or incorrectly were also shown and were able to be analyzed during the class. This made the technology more efficient for Doe to use when determining what information needed to be retaught or reviewed before the next day's test.

The *second observation with Doe* was using a tool called Photo Story 3. The tool is one that gives users the opportunity to create a slideshow that includes images, voice, text, and audio. When I presented this lesson to the staff during professional development, Doe watched but did not actively participate. Having seen this tool in the past, Doe expressed that it would work better than the others demonstrated for students to use when presenting their research on a topic. We met one-on-one twice to discuss and plan the lesson that would use this tool. We went over how to use the tool together,

different insights I had from having used the tool with students in the past, and formatting tips and tricks I have used when creating a slide presentation with the tool. Doe seemed excited to use the tool in class; they were trying to determine which topic would be the best fit for a Photo Story. Doe created a list of topics that the students could choose from, determining when in the semester they would be able to implement the tool.

The objective of this lesson was to have students use Photo Story 3 to create a slide presentation about a historical topic they had researched in class. Again, Doe's classroom was set up in a U shape with the interactive white board mounted to the center wall where all students could see it. This made it easy for Doe and me to walk around the classroom and view students' screens. Students were still able to pick their own seats.

When I modeled the lesson for Doe, a few students were familiar with the program. I explained what Photo Story 3 did, how to import images into it, and how to add voice, text, and audio to the program. We spent time specifically on the audio portion of the presentation, as students were able to create their own music for the slide show. We also went over how to save the slide show to their devices and upload it to Google Drive. Throughout this process, I was creating a Photo Story on the interactive white board for Doe and the students to visually see the steps in the process. Students seemed interested in the assignment and began to work on researching their topics so that they could create a Photo Story. As I modeled the tool, Doe asked questions of me during this process. Doe watched attentively with students when I was showing the steps in preparation for their presentation of the lesson later in the day.

Later in the day, while I was on my way to work with another teacher, Doe stopped me in the hallway to confide that they did not feel confident in teaching this

lesson in an upcoming class period. I listened to their issues and told them that I understood their nervousness. I asked if they had any questions that I could answer about the program or if there was anything I could do to help them feel ready. Doe did not have any specific questions. I did remind Doe that I was a participant observer, that I would be with them in the classroom and could answering questions or help if needed. Doe agreed to do the lesson later in the day.

The class period that Doe presented the lesson to had 21 students in it. All students but two had their devices. One student said he did not bring his to class and the other did not have his. This second student became disruptive during class. Trying to complete their lesson, Doe described the research students would be working on and how Photo Story 3 would be used, asking me questions as needed during the presentation. The disruptive student's behavior became more troublesome, as he began to yell at another student — all while Doe's presented the lesson. Doe had to remove the students from class, asking them to wait in the hallway until they could speak together about the issue. Since Doe had not been able to finish the lesson and give all of the information about Photo Story 3, the students were instructed to pick a topic and begin working on their research. Once they knew what they were researching, they could look for pictures to use in the Photo Story 3. Doe told the class that they would finish the lesson the next day. Doe then stepped out of the classroom to meet with the students in the hallway. I continued to walk around the classroom and answer questions while Doe and the two students were in the hallway.

When Doe returned and the class ended, they reflected that the lesson did not go as they wanted it to. Doe said that they would finish the lesson the next day and asked

that I come back to a different class period to observe. I agreed. During the second class I observed, Doe seemed more confident in the use of Photo Story 3 and the lesson itself. This class had 29 students and all but one had a laptop to use, as their laptop had been taken away by the guidance counselor. This student was given permission to work with another student on the project. The desks and the classroom were set up in the same configuration as the previous class had been. Doe kept the class focused and explained the research assignment and technology tool well. Doe created a Photo Story as they explained the tool, allowing students to see how the program would be used. They gave students topic ideas, answered questions about the assignment, and helped to clarify any points that students were unsure of with the technology. Doe allowed students to create their research projects in pairs. Once deciding on a topic, some students began to research while others began creating the Photo Story 3. Not all of the students were using the technology tool modeled in class when working in pairs, as the tool is not one that can be used to create collaboratively, the lesson went well.

Using the RAT Framework (Hughes, Thomas, & Scharber, 2006), I judged this lesson, overall, to be Transformation. The Photo Story 3 program gave students a new way to display their information. Instead of a static tri-fold poster board with drawings, printed images and words, the information students researched was on display with slides, transitions, and music. While a Google Slides presentation or PowerPoint would have had a similar effect, the inclusion of customized motion in the slides and the music created for the project set this technology tool apart. Students were able to research images, edit them together, and tell a story about a topic that would not have been possible without the technology.

Experience with the study. Doe's experience with the professional development and coaching was that it gave them the knowledge and confidence to try new things. In our first interview, Doe acknowledged, "I do think that I could do more [said with a questioning emphasis]." Doe continued, "I could mix it up. But I just get sort of stuck in doing the same thing." This study helped Doe to be less "stuck." Doe felt that the school encouraged teachers to devote the time to learning new technology and to implement it into the classroom. They said,

> If I try something new, and maybe it doesn't go that great, at least I tried. You know? And, like, it's…a learning opportunity for me, as well as for the kids. Like, that kinda thing. A lot of schools that don't really emphasize technology like that, like, they get…they'll get super annoyed if you are, like, trying all these new, different things.

The school provided Doe the opportunity to try something new when using technology integration. It gave Doe the chance to "mix it up" and the freedom to take risks with their lessons without fear of annoying the administration. This was valuable to Doe because it provided them with an ability to plan lessons for students that were focused on meeting the needs of the learners, using the technology Doe felt was necessary. After each technology integration lesson Doe did, even the first Photo Story 3 lesson, Doe showed growth and confidence in the tool they had chosen to use with students.

Due to the study, Doe was able to try new practices with support and guidance. In the second interview, Doe stated, "I think it has helped me a lot. Um, I mean, we've…we've looked at things in, like, tech PDs here that I've been able to then, like,

use in the classroom." They specifically mentioned trying something different from Kahoot to help students' formative assessment: "I used new review games that I felt…I liked better than the ones I was using before. Um, so I feel like it's had a really positive impact." Doe was more confident implementing the new tools after the professional development sessions. Doe tried Quizizz and had a positive reaction to how the students participated and the data that was able to be gathered from the results. The experience Doe had with the professional development was positive and encouraging.

Jane (Pronouns she/her)

Participant description. Jane stepped away from education after working in a school, in a district, where she felt discouraged and was beginning to burn out. She found other employment and sources of joy during this break. Before leaving the classroom, Jane had earned an administrator's certificate and worked in administration at a school. However, when she decided to come back to education, she chose to work with students directly in a classroom and took a teaching position at her new school. Now, at age 37, it was evident that she worked hard to be and do her best for her students. This was shown in her planning, classroom management, and interactions with students. For example, she was an active participant in meetings, planned her lessons with her students' abilities, weaknesses, and needs in mind, and shared personal stories and anecdotes with students to create a sense of community in her classroom. Students were encouraged to ask questions and share their thoughts during lessons. Jane set a respectful tone in her classroom, one that students had to adhere to when making observations, comments, or answering questions. She handed out performance tickets, physical raffle tickets that could be redeemed for a chance at a prize, to students who answered questions, acted

appropriately, or made good decisions. While not overly strict, students knew where Jane's line of acceptable behavior was and not to cross it.

Jane's classroom felt like it was a community. In addition to the banter and kind words, Jane used prizes and incentives to motivate students' behavior and work. She was constantly on the move in her classroom, walking in between rows to speak with students individually, to monitor what they were working on, or to drop a performance ticket on a desk. These performance tickets were used in daily or weekly drawings for prizes that Jane provided. Students were excited when they got tickets; they were visibly more attentive to Jane when she was walking around placing them on the desks. The community atmosphere was also evident in the way the students worked with each other. While in short rows, the students sat close enough that they could collaborate on assignments or edit each other's written work. The students spoke respectfully to one another when offering suggestions or complements on work. The students seemed to thrive in the community that was established in the classroom. Students entered the room in a clam way, without screaming or pushing. They were usually seated and prepared to work once they had entered the room.

Technology was welcomed in Jane's classroom. She began using technology as a teaching tool in her undergraduate schooling. She understood its value and the role it played in education. She liked that she was currently at a one-to-one device school. "I have been at schools where they didn't have access to technology. Um, where I walked into the building and they said here's your chalkboard and your projector, and I didn't know what to do," she said. Jane knew that technology would play a part in her students'

futures. She wanted them to be prepared for their high school experiences and beyond. During her first interview, she remarked,

> I want to know, you know, what's new. I want the students to be doing what's new. I want them to go to high school and college being up to date on what they're using there. Because I remember being in college, and I met students who had never used PowerPoint before. And I had been using PowerPoint since, like, 7th grade.

She recognized that students found technology engaging and relevant. Therefore, she wanted to know what she did not know about technology. She remarked during an interview that "it's something that's important to me because I don't want to fall behind." Jane was concerned that if she was behind in her knowledge of technology, her students would be, too. This obliged Jane to become familiar with new technology tools whenever the opportunity presented itself. She provided her students with exposure to the tools available and opportunities to use them. Because of this, she was focused and thoughtful when learning a new technology tool, actively thought about how and when she could use it. For example, in a professional development session, she wondered aloud, "Where would it be really effective? What kinda' lesson would that be effective in?" She took notes, asked questions, and paused for clarification as needed. She modeled the behaviors she wanted her students to see when learning something new.

Observation descriptions. *Jane's first observation* tool was Photo Story 3. She was an active participant in the school professional development presentation, sitting close to the front and asking clarifying questions. Not long after, we met during her planning period to create a lesson. Jane wanted to use this tool with her class's social

justice unit. During this unit, students researched different topics, based on issues they had chosen. Jane and wanted them to have different options in how their research would be presented. A Photo Story was one tool she wanted to show her students.

The objective for this lesson was to introduce Photo Story 3 to the students. Jane wanted to give them an understanding of how the program worked, and to have them create a practice assignment using the program so that they would have a background in using it.

I modeled the lesson for Jane and her students the day of this observation. Jane paid attention to my teaching, asked questions, and encouraged students to think of how they could use the program in their own work. She walked around the room and monitored students' work with me when I gave students a practice assignment to do and turn in during the class. After students turned in their work, I showed several of their projects on the interactive white board. We discussed successful aspects of the work and learned more about the students, as the assignment was entitled "All about me."

For Jane's lesson, there were 27 students in the class. All had laptops that were charged and ready to be used. When Jane began her lesson, she seemed somewhat sure of herself. She did ask me questions a few times during the lesson, but overall, she had a solid working knowledge of how the program worked. Jane's classroom was set up in a U shape with short rows that lined the perimeter walls and faced into the center of the room. This made it easy for the teacher to walk around and see students' screens to make sure they were on task and to help if they asked for it. The students watched this portion of the lesson as a whole group. Jane used the interactive white board to model the lesson where she created a Photo Story about herself for students. She asked them engaging

questions at each stage of the creation process, like their thoughts on an image, the music she chose, or what she should say when describing an image, giving them a chance to ask her questions, as well. Since they had been studying tone and mood in class, Jane took specific time during the lesson to discuss with students the effect that the music they created in the program could have on the viewer. She also reminded them how important the music could be in creating the right tone and mood for their project. These teachable moments were created whenever possible, adding a richness to Jane's implementation of the program. It was evident that Jane had practiced using this program and was well prepared for her demonstration of it. Students were then asked to create the "All about me" presentation that had been included in the earlier class. Students worked well on the project and turned them in time to be shown during class.

After class, Jane seemed unsure of her performance using the tool, thinking she had not covered all of the components it possessed. I disagreed and complimented her good work. I felt students would be ready to use this tool when creating their social justice presentations. She seemed to become more confident in her performance after our conversation. In her reflection on the lesson, she mentioned that students seemed interested in what she showed them but she also noted that she forgot a couple of things. In stating what she learned, Jane said, "I learned that I have to be careful to address the different features of new software. I also learned that I should not be afraid to take class time to show the students how to properly use technology applications." Jane's reflective nature gave her the ability to acknowledge both the weaknesses and strengths of the lesson and how she could improve in the future.

On the RAT Framework (Hughes, Thomas, & Scharber, 2006), I would classify this lesson as Transformation. Using this tool, students were able to research images, edit them in a way that made them make sense, and add music to augment the theme and mood of their story. This could not have been done without the technology provided. Instead of creating PowerPoints, a tool that students had access to and had used for similar projects in the past, Jane wanted to incorporate a new tool into their repertoire. This tool could be used for other projects the students had, as well as for personal slideshows. In comparison to PowerPoint, this tool gave students more ownership over their work, as they created the look of the slideshow, the transitions of the images on screen, and the music that accompanied the show.

During her second observation, Jane chose to use two presentation tools. She wanted to incorporate both My Simple Show and Emaze into a lesson. These tools were shown to the staff during professional development meetings. Jane and I also met one-on-one to review them and plan a lesson that demonstrated the tools to her students.

The objective of this lesson was to introduce students to My Simple Show and Emaze. As stated earlier, Jane wanted the students to know several presentation tools before they began creating projects to present their social justice research. While the first and second observations were completed a month apart, Jane's unit focused on creating a research project. Students were researching, writing drafts, and peer editing in between these observations. The presentation creation was to be the last step of the process. She again expressed her interest in students having options other than PowerPoint presentations and poster boards to present their work. She thought some students would be using in Photo Story 3 but wanted them to have more choices.

After planning our lesson, I modeled the tools for students and Jane during a class period. I demonstrated how to create a My Simple Show and then an Emaze. After each demonstration, the students were given a mini assignment to complete, much like they had with Photo Story 3. They were familiar with this procedure and worked well on completing their assignments. I was able to again show the assignments students created on the interactive white board, which the students enjoyed. Jane again paid studious attention to my presentation, making notes for herself as needed. She also walked around the room and helped the students when they were creating their assignments, establishing and enriching her knowledge of the websites.

The class Jane chose for her observation had 30 students in it. All of the students had laptops that were charged ready to be used. Jane seemed comfortable with both the My Simple Show and the Emaze when she described the tools to students. She asked me questions as she demonstrated the sites to students, but these questions were more for confirmation than answers. She showed students My Simple Show first. She remembered most of the steps to create a project using this tool. She gave students an overview of what the program did, the steps in the process to create their own Show, and how to finalize and turn in their work. Students seemed engaged in the lesson and liked the storytelling aspect of this tool. Next, Jane demonstrated how to use Emaze. She showed students how to login to Emaze, how to select the template they wanted to use, and how to begin creating a presentation. Students were attentive to this lesson, as well, answering questions she asked and asking Jane questions, too. Students were then given quick assignments to create using both programs. They worked well on the program, commenting on likes and dislikes as they went. Jane walked around the room and

answered questions, provided advice, and commented positively on students' projects. She discussed with students which of the tools they may use to create their research presentations in the future. Overall, it was a very collaborative environment. The students submitted their assignments before the end of class and Jane displayed them on the interactive white board.

On the RAT Framework (Hughes, Thomas, & Scharber, 2006), I would classify this lesson as Transformation. My Simple Show and Emaze were similar to PowerPoint in their layout and presentation. My Simple Show, however, added animations and interactions that PowerPoint did not provide. Emaze, too, was similar to a PowerPoint, but had different transitions and movements to engage the viewer. While these tools were not inventing anything new, they were increasing the productivity of students and showing the information in a different way. A fundamental change was not made, but students were able to use multimedia to create a presentation that they would not have been able to give without the technology.

Jane and *I completed a third observation together*. While it was not included in the study or the data collected, the observation was one that stood out. Jane and I spoke about a third observation after a whole group professional development session that she attended. While Jane had already completed two observations, she was interested in trying the new tool in her classroom. Because we had become accustomed to the research study's process, we continued our routine of meeting one-on-one to review the whole group session and planning a lesson. Just as in the past, I modeled the lesson using the tool Quizizz for Jane and she observed me. This was a game that Jane had created. When it was her turn to teach the lesson, Jane was much more confident during this

observation than in the first two. There was very little that she asked me to help with during this lesson. After playing the game, she reviewed the data collected from their answers with her students. Being able to see the class's overall score and percentage of correct answers was interesting to the students as well as the teacher. The class asked to play a second time and were encouraged when their scores and the class averages increased. At the conclusion of the lesson, Jane seemed as confident in her technology integration abilities as I had seen her.

Experience with study. Jane's experience with the study was positive. She was always willing to meet for an interview or a professional development one-on-one session. In the first interview, when asked how comfortable she felt when using technology in the classroom, she answered, "For the most part, I feel pretty comfortable." In the second interview, her definitive answer was, "I feel extremely comfortable." Jane's confidence in her abilities to integrate technology into her lessons grew during this study. When asked in the second interview what prevented her from using technology more in her classroom, her answer was revealing. She said, "I don't think that anything, quite honestly. Really nothing, like, prevents me from doing that." Jane's growth in her knowledge of technology tools and how she could integrate them gave her a confidence in her implementation.

Having been out of the classroom for several years, both when she was an administrator and in her time away from education, Jane was not as comfortable or as knowledgeable as she wanted to be with integrating educational technology. Her fear at the beginning of the study was of being "behind." She recounted her first encounter with Kahoot during a summer orientation session with the school district. She had never used

the site before. She enjoyed it in her orientation and said, "I had to use it in my class because it kept me pretty engaged." Jane did not like that she had learned this program later than others. She asked me if I knew how long Kahoot had been around. I answered, "Awhile," and she agreed. Her response was, "I just learned about it last year. And I don't want to be that person." She mentioned "falling behind" a few times during her interviews. She appreciated the mandatory grade-level professional development sessions because:

> At this school when you come in on Wednesdays, you're showing us a bunch of different things that are up to date and new. Um, and I haven't had that at other schools. I mean, we've had some days where you know they're like, "Oh you can sign up for tech training, if you want."

It noted that Jane felt a responsibility to learn what she could about technology. She wanted to know what was available so that she could teach it to her students. She stated in her second interview, "I think it's important because we have to make sure that our students aren't behind when it comes to technology, um, in high school and careers." Jane worked hard during the study to learn about the tools we discussed, how to implement them into her lessons to maximize their effectiveness, and how she could use them, herself, to model them for students.

John (Pronouns he/him)

Participant description. In his 50s, John was not new to education. He had been working at his craft for more than 10 years and his comfort as an educator, mentor, and evaluator was evident in his interviews and classroom manner. He had experience in several different educational roles and at several different schools over the years. As he

moved from school to school, position to position, he had picked up different strategies, techniques, and methods that served him well in the classroom. John was not afraid to ask for advice or to take it. His classroom was set up for learning in groups for teamwork. This seemed to be similar to how he worked, as well. John was a collaborative person. He planned his lessons with his team, deferring to the pacing of the group as needed. He was collaborative with his students, too. He engaged them in conversations that worked to help them reach a conclusion or a solution of their own instead of providing an answer. He focused his time and energy in the classroom to increasing students' ability to work together.

John's classroom was organized. Students knew the standards he expected for routines and procedures, and they abided by them. While he was not afraid to joke or talk with his students, he was always respectful to the students, and they were respectful to him. He moved around the room during specific times, like during bell work, independent reading, and table discussion time, with purpose. Students who were off task were redirected; students who were working well were praised. When a special education co-teacher pushed into his room for a period a day, he adjusted to her presence easily and worked well with her. Students were not distracted by the presence of another adult because he did not give them the option or opportunity to be.

Technology was something John was open to using more of. Based on his past experiences, he had a positive attitude towards technology integration and a solid knowledge of programs he liked to use. One program he mentioned he would like to start implementing was Booksource, an online library system. Having used it in the past, he knew the benefits it would have on his classroom and to his classroom library. He

shared, “I used to have my library scanned in, so the kids could check it out and I’d just go ‘beep’, and they checked out a book from the classroom library.” He was interested in using this because it would provide him with a way to track his books’ usage, track his students’ reading, and keep up with series and genres that were popular. Using a tool like this gave evidence that John wanted to integrate technology that worked for him. While he cited “lack of knowledge” as the reason he did not use technology more, he knew and used many websites in his teaching. John implemented programs he had picked up during his career, like English Language Arts practice websites ReadTheory, NewsELA, and Quill, to provide students an alternative way of learning about his core content. He was very comfortable using these technology tools, and it showed in his implementation of them. He did not get flustered easily if the technology he was using was new or did not work as he had expected. He was able to adapt and adjust.

A drawback to implementing new tools for John was that he thought his students would learn the technology faster or more in depth than he would. In an interview, he stated that if introduced students to a program, showed them the basics of how to use it, they would continue to learn more about it after the lesson ended. He said, “If I can get them basically started, they’ll figure it out from there. And then, of course, they feel great.” He continued, saying that the students might ask him “Did you know that?”, to which he would reply, “Nope. So, you teach me. Like I’m an old man.” While he did not always have confidence in implementing a new tool, John was comfortable enough with his own abilities and with himself to admit to students that he did not know everything, but that he was constantly learning. In turn, students saw their teacher as someone who was willing to try new things and learn from doing.

Observation descriptions. John chose to use Flipgrid *in his first observation lesson.* John participated in a staff professional development session during which he created a Flipgrid that was posted to the training page. He expressed interest in trying the tool. We met during one of his planning periods to discuss the lesson in which he wanted to implement this tool. He was interested in finding a way for students to become more focused on their independent reading, which he had them do during class, and having students make connections between the content being taught in class and the students' reading. He was excited to try Flipgrid with students, having them record themselves discussing the parts of the book they had read independently and relating their reading to the literary concept they were discussing in class. We used this planning time to create a Flipgrid page for one of John's classes. After our session, he went on to create Flipgrid pages for the rest of his classes using the specifications we decided upon.

The objective of this lesson was for students to become familiar with the online tool Flipgrid and to use it to give information on the books they were reading. John wanted to use this tool as a way for students to autonomously "check-in" with him when they felt they needed to or he asked them to.

I cotaught the first section of John's classes, modeling the setup and creation of a Flipgrid for students and John on the interactive white board. The students were not familiar with this tool, so I made sure to show each step and explain its importance as I went. Students were most interested in using the stickers to decorate the selfies they would take. They also showed appreciation for the stickie note feature that stayed on screen and could help them remember what they wanted to say. They were, however, resistant to filming themselves discussing their books.

John's classroom was set up in small groups for this lesson, four desks being placed together for students to sit in, in several groupings around the room. The students had assigned seats in this classroom. There were 24 students present for the class and all had laptops to use. John seemed confident when he began his lesson. He started with bell work, as he often did. Then, he told students what the day's plan was and asked them to take out their independent reading and read. Beginning like this was a part of the class routine. It also allowed all students to have read some of their independent reading books and have something to share on Flipgrid. Several students picked out new books from the classroom library during this time. John walked around the room as students read, discussing the students' reading with them and asking them questions about their books. After the allotted time for independent reading, he brought the students back together and presented Flipgrid to them as a whole group. He went through the steps in the process of making a Flipgrid, as he had seen me do. He explained to them well what he wanted them to say and do to complete their assignment. Students were, again, unfamiliar with this program, so they listened attentively and were apprehensive of filming themselves, too. Students transitioned to independent work and began to prepare to film themselves. Some students asked to film in the hallway, so that others were not watching them during their speech. John agreed to this. One student became almost disrespectful in his refusal to participate in the assignment. The student did, however, end up filming himself in the hallway in the end. During this time, John was understanding of the student's position and feelings. He listened to the argument the student made with empathy, but he did convince the student to complete the assignment. John did not let the student's refusal to comply override the classroom environment.

Students completed the assignment and were able to view each other's work on the Flipgrid page when they were finished.

Using the RAT Framework (Hughes, Thomas, & Scharber, 2006), I would rate this lesson as Amplification. Flipgrid allowed students to privately report their reading assignment to the teacher and class without having to write out the summaries of their reading and then stand in front of everyone to present the information. This differs from how the assignment was previously completed, as students would have simply written out their summaries on paper and turned them in. Those students who were averse to typing were able to speak their learning and participate in a new way.

John's second observation used the online boardgame Quiznetic (now called QuizWhizzer). This was a formative assessment tool that was shared with teachers during a staff professional development session. The teachers participated in the game as players so that they were able to understand how the program worked from both the teacher and student perspective. John thought that his students would enjoy this assessment tool. We met during his planning period to review the game setup and how it could be implemented into his classes. He was teaching a unit focusing on literary terms at that time. He felt that a formative assessment on the terms and definitions involved with this unit would work for the boardgame. We reviewed how to login and create a game using the software, and John created the game before the date of the observation.

The objective of this lesson was for students to show their knowledge of the literary terms and definitions they had been studying in class. Quiznetic was the tool that would be used to accomplish this goal.

I cotaught John's first lesson with this tool. I introduced students to the concept behind the game, showed them how to play, and helped them to understand the rules of the game. The students did not like that they moved back spaces when they missed a question, a setting we put in place, but they were positive about playing an online board game. It took students a moment to understand how to play the game. As they became more familiar with the format of the questions and the movement of the pieces, they became much more excitable in their play. John watched as I modeled the introduction of the game and rules to students, walked around while the students were playing, and encouraged students in their work. He also allowed the students to use any notes they had taken on the topic, which made several students with notes happy.

There were 21 students in the class that John taught. Only 19 of the students had laptops to use, as one had turned their laptop in for technical repair and the other had cracked the screen on his laptop. The two students without laptops were allowed to pair up with another student in their foursome to participate. Two different students had uncharged laptops and did not bring their chargers to class. They also were able to pair up within their small groups. Students were again allowed to use any notes they had taken to complete the game. John explained the game to students by playing it with them. He began the game and gave a thorough explanation of the tool, showing how a correct answer would advance the game piece, the loss of progress when missing an answer, and overall rules of the game. John again walked throughout the class as students played the game. As this was a special education inclusion class, John also helped some students by reading questions and answer choices aloud. He left the boardgame board on the interactive whiteboard as students played, allowing them to see

their progress. Students were excited about playing the game and took to it well. They asked to play more than one game, which John agreed to.

In using the RAT Framework (Hughes, Thomas, & Scharber, 2006), I would classify this lesson as Amplification. Using the online boardgame, students were able to show their knowledge in a way that was different than in an offline game. The game was more efficient, in that students all took their turns at the same time and were able to move through the game without waiting for other players to take turns. Review, in the past, had been verbal or through a Kahoot. Students were less in control of their learning and less engaged in the review previously.

Experience with the study. John's experience with our study was one of growth. While John was comfortable with the technology he knew, he became more comfortable using new technology with his students and trusting them to use it, too. As described earlier, when asked during the first interview what prevented him from using technology more in his classroom, John's answer was "lack of knowledge." He went on to answer, "I guess you could say fear, because of lack of knowledge. [laughter] Not ready to use it. Especially with these kids, because a lot of them are tech savvy."

As the study progressed, and John had more chances to use the technology displayed during professional development sessions in his classroom with a coach, his answers changed. In the second interview, when asked how the professional development has impacted his feeling of readiness, John replied, "I guess it just makes me a little more savvy." John became more willing to try new tools and give the students new opportunities with technology. When asked during the first interview what could be

done to help him improve technology integration, his answer was "time." In the second interview, John's answer changed. He said,

> For me it just, me personally learning more. I don't know everything that's out there. Um, trying new things. They were talking about Quizlet. I hadn't…I haven't really utilized Quizlet. Just haven't done it. It's just one of those ones I haven't done.

As John progressed through the study, he shifted his mindset from needing more time to needing more training. He ended up asking to learn more about a tool he could use in the upcoming schoolyear.

Themes and Interpretations

Qualitative data was collected through interviews, transcribed, and coded. This process yielded five specific themes. These five themes: (a) persistent issues with technology that prevent teachers' technology integration, (b) teachers' positive and negative experiences that enable or prevent technology integration, (c) teachers' perceptions of their current practices, readiness to integrate, and future plans for integration, (d) teachers' perceptions of technology and technology integration for students, and (e) teachers' perceptions of the professional development, and its effects on them and their technology integration. Each of these are discussed in greater detail in the following sections.

Theme 1: Persistent Issues with Technology That Prevent Teachers' Technology Integration

This theme represents persistent issues with technology that prevent teachers' technology integration, and specifically, those that were not and could not be served by

PD. First-order barriers, those that are "extrinsic to teachers" (Ertmer, 1999, p. 2), were not issues that could be dealt with through the school's offered professional development sessions. For example, Ertmer (1999) identified first-order barriers to include hardware, software, time to plan, and technical support. Participants in this study had to deal with some of these issues, specifically involving hardware and software. These are two areas of integration that were outside of the participants' control but did impact technology integration. These first-order barriers were issues that had to be addressed by school administrators, computer technicians, or the district, itself. Participants identified the categories within this theme as hinderances to their successful implementation of technology. These barriers limited the abilities of participants and the researcher, as there was no professional development or training that could have been done, within the confines of the study, to remedy these issues.

Issues like these are not uncommon in educational technology integration. Ertmer (1999) refers to these barriers as "those obstacles that are extrinsic to teachers" (p. 50). She identifies equipment, specifically, in her research as being extrinsic barriers. This theme was broken down into four categories. Hardware, software, more work for teachers, and troubleshooting are all obstacles that teacher-participants dealt with on a daily basis, but may not be able to overcome. These barriers do affect the integration of technology into the classroom, but professional development sessions were not offered on how to troubleshoot malfunctioning hardware or software. If teachers wanted to learn how to solve these problems, they used their own time. Hew and Brush (2007) categorized time as a barrier to integration. This research supports the participants' mention of more work for teachers, essentially time, as a barrier to their success. The

four categories identified in this theme, (a) hardware, (b) software, (c) more work for teachers, and (d) troubleshooting, are each described below.

Hardware. In this study, hardware is identified as the physical pieces of technology used in the classroom. This includes the laptops both teachers and students used, the interactive whiteboards, and any cords or wires that went along with these devices. Issues with the hardware were not able to be fixed by the study's participants. They received no formal training, for example, on fixing laptops, resetting interactive whiteboards, or replacing damaged or malfunctioning cords. The school in which the study took place had a dedicated system support technician. This person worked to repair broken laptops, interactive white boards, and the like. Although he was able to fix some issues, some devices had to be fixed by the manufacturers or company contracted technicians. Also, interactive white boards were installed a few months before the study took place. The teachers and the technician were still getting accustomed to them and how they operated during the study.

Hew and Brush (2007) note that "without adequate hardware and software, there is little opportunity for teachers to integrate technology into the curriculum" (p. 226). The only mention of inadequate hardware during the interviews was by Anne. She identified that an increase in hardware would improve her implementation of technology saying, "if I had cameras…[I] could do photography/photo editing on Photoshop." This lack of hardware kept her from integrating technology into her art classes and reaching her overall goal of creating art with technology.

Aside from cameras, there was an adequate amount of both hardware and software available to teachers during the study. The teachers did remark, however, that if

the technology did not work, or the students did not bring it to class, there was little opportunity for instructional use. Doe commented on a common occurrence in their class. Doe said that students often forgot their tablets or brought them to class without a charge. Other students had tablets taken away by administration for misuse, often looking at inappropriate images or playing games during class. Doe remarked that they had a student in this situation. Doe said, "I have a kid whose tablet got taken away because he was using technology inappropriately at school. But they're doing a research project. So, I'm like, 'what am I supposed to do?' " The student did not have access to the technology needed to complete an assignment. Doe faced a first-order barrier here because the student did not have access to the necessary hardware and software to complete the assignment. Doe had to find time and materials for this student so he could complete the lesson. This took time and attention away from Does' other responsibilities.

During their interviews, some teacher-participants referred to hardware issues as direct reasons that they could not integrate technology the way they wanted to. Anne commented that she had had an issue with her hardware on the same day as our interview. She said,

> My technology didn't work. And, then, when you've got this kinda plan to show this little 3-minute video, and you spend 10 minutes trying to get the sound to work… that becomes, you know, kind of the bummer. That's the downside to using technology.

She continued, "If you depend on it and you start to depend on it, it… when it doesn't work, that kinda puts a big 'ole monkey wrench in things." This barrier, hardware that does not meet the needs of the participant, had a negative effect on the participant's

ability to integrate technology effectively and caused the teacher to have a negative perspective when using technology in the classroom. She stated that the technology not working was a "downside." Anne needed the technology to work. Having to alter plans to accommodate a shortcoming in the technology made her distrust the technology.

Software. In this study, software relates to intangible elements that are used to implement technology. This includes, but is not limited to online resources, internet connections, and computer programs. Software issues were extrinsic to the participants, as they could not fix an internet connection, unblock websites caught in the district's internet filter, or make a program work with the school district's Google accounts. Professional development sessions and help from the school's technician were not solutions to these issues. These all created first-order barriers to the successful integration of technology.

Students' using software incorrectly was an issue that Jane was dealing with during the study. She explained,

> We used [Storyboard That] [a website that allows users to plot out points of their stories using a storyboard template], and the reason why it wasn't successful is because students couldn't access it correct. You know, the right way. And so, we started to do it and then like all their…they couldn't get back in. Something like that happened.

She continued, "So, we spent all this time doing these cute little things and then they couldn't send me the links to it. It was a disaster." This "disaster" kept Jane from completing the lesson she had planned and made her leery of trying new websites with her students. She said, "I haven't used it in a while because of that." Because students

were unable to submit their work to Jane, due to login issues or an issue with the site, Jane stopped using this tool. The software, in this situation, failed the teacher-participant and students. It acted as a barrier to learning. This software changed Jane's perception of technology integration. If she could not get the work her students created, she could not justify continuing to plan lessons that used this tool.

John had an issue with outside software, software that the school district does not purchase or provide professional development on, not integrating with school district email accounts. He stated that, "like Read Theory, all of a sudden a kid disappeared." He continued saying, "Their accounts weren't working. Or, you know, NewsELA. Had problems with them [students] getting into classes." Similarly, Teachers who could not count on the software to work had to come up with other options for their students to do in class. This did not always involve technology. For example, John, at times, reverted to students turning in bell work on paper at the beginning of the class.

Anne's lack of software also acted as a barrier for her. Because the school did not have software that would help students in the creation of art, she did not know how to use technology effectively to achieve this goal. Software that was shown during professional development sessions was not subject or content-specific. This did not help Anne. She remarked, "I don't know all the media tools for creating art. Um, and that's what they need to be doing when they're in my classroom. So, I'd rather them be creating art." She mentioned that having a software, something like Photoshop but more age-appropriate for younger students, and being able to teach it to the students would help with her vision of integrating technology into the creation of art. She stated, "I would like to do, like, a class on photoshop." Anne said,

> It'd be nice if there was something a little bit more user…friendly for middle school. Something where you could do photography or create art where it wasn't quite as complicated. And, I don't think the kids have anything on their computers that do that.

For Anne, the software issues were more than just logging in or turning in assignments. It was a problem of not having the software she wanted to complete her goals. This first-order barrier kept her from integrating technology into her lessons the way should would have liked. Her perception of technology integration was that of someone who was interested, but did not have the resources needed to use it. It did not work for her, so she did not use it. She focused on creating art in traditional ways.

More work for teachers. More work for teachers is defined as the unplanned work teachers may have to do due to an issue with hardware or software. Hew and Brush (2007) identified time as being a resource that, when lacking, could be another first-order barrier. They stated that "teachers needed hours to preview web sites, to locate photos they required for the multimedia project they assigned to students, or to scan those photos into the computers" (Hew & Brush, 2007, p. 227). When teachers plan lessons or assignments that integrate technology and then the technology tool does not work correctly or students have an issue with technology, the teacher must have another option. Creating both a technology-rich and a technology-free lesson, finding the resources needed for these, takes time and access to the documents. Doe remarked, "I know I'm supposed to, but I don't always have like a solid backup plan." A "backup plan" was a lesson plan that teachers would have to have created in case students' were unable to complete the technology integrated lesson they had planned originally. The participants

in this study stated that this was not something they could always do in their allotted planning time.

When hardware or software does not work, the teachers have to be prepared with another option. During the interviews, several teachers remarked that integrating technology made more work for them than not using it at times. Doe remarked that, "they [the administration] tell us, like, 'Well make sure you always have it on paper'. But I feel like when they say[that], they're only thinking as far as, like, if you're having them reading something on the computer." Entire lessons or assignments may have to be recreated due to an issue with hardware or software. Doe referred back to the student who had his device taken away. The student still had to complete the research assignment, but did not have the tools needed. I stated the student would need to use books, which were not provided in the classroom, to which Doe commented, "Exactly. That's just more work for me." Both Doe and Jane remarked on the extra effort involved on their parts if students do not bring their devices to class. Jane stated, "If they don't bring their technology, then it kind of creates a discrepancy in what they're doing and creates more work for me." John took a different approach to this issue, though. He said, "I've taken computers away because, you know I'm only going to say so many times, 'get off the YouTube videos,' and then the computer's mine. And now you have to figure out how you're going to finish this assignment." While this tactic can work with reading assignments or worksheets, if the school does not have the necessary resources for students to complete the assignments offline, teachers would have to intervene. Perceiving that technology integration is more work than creating a lesson plan without technology led some teachers to think negatively about including technology into their

lessons. This first-order barrier was not easy to overcome. The teacher-participants saw the amount of time they put into planning a lesson. Having to create a second lesson was not something they had time to do. The work involved in planning two lessons was a deterrent to the teacher-participants' integration of technology. Doe and John both described having to provide the work for students without technology. This first-first order barrier includes what Ertmer (1999) described as a "lack of access to computers," as well as, "insufficient time to plan instruction" (p.2). Teacher-participants had to plan additional lessons and discern ways for students without technology to complete assignments. This was not a feasible option for them. As the school had access to the technology needed, the lack of computer access and time to plan became burdens for the teachers to contend with, not the students.

Troubleshooting. In this study, troubleshooting is identified as the act of trying to identify and/or solve a problem related to the hardware or software being used. Troubleshooting was mentioned, in some form, in all of the interviews. While hardware issues were often what need troubleshooting, teachers often had to try and figure out how to use or navigate a software that they were using without success during class. For example, John mentioned an experience with student laptops not working during state testing. He said, "If there's something going on with the computer, that'll slow me down." John would have to stop his lesson or state testing to help a student with whatever issue was present, or he had to make the student wait until the rest of the class was working to determine what was wrong. Troubleshooting the problem during an active lesson or state testing was not conducive to the goals of the class. In addition to this, several of the teachers mentioned also having to advise students on how to use

software during a class, thus helping them to learn their own problem-solving skills. Doe, for example, stated,

> Sometimes I teach them, just like, you know, the basic skill of just like Googling. Like, something's wrong with my computer, or something's wrong with this. So, Google…how to reset this on this computer. Like, that's just something you need to know how to do.

Although this was not a part of the technology integration, Doe wanted students to know how to troubleshoot their own issues, whenever possible. This kept students in the classroom and working. Leaving the room for technical support often resulted in students not having devices for several days or missing significant portions of class while the technology was being fixed.

During the study, both the students and teachers in the classrooms required troubleshooting help from the school's technician, the educational technology coach, or both. Ertmer (1999) identified a need for more hands-on help with technology when it is new. She states that "over time, teachers' technical dependency tends to decrease as they learn first-level problem-solving skills" (Ertmer, 1999, p. 57). As teachers became more familiar with the technologies being used in the school, they became more adept at troubleshooting. For example, Doe began relying on the knowledge of their students, while John tried to learn what the school's technician had done to fix a problem. The programs and hardware that teachers mentioned needing help with were not those discussed in the school-wide professional development sessions. The knowledge needed for how to troubleshoot these issues had to come from the teachers themselves.

While professional development sessions could show teachers how to use a software or hardware tool, they could not account for everything that could go wrong. These external issues that cannot be planned for can lead to teachers finding the technology to be a barrier to achieving their objectives. Sandholtz and Reilly (2004) state, "With limited or no technical support, even teachers with well-developed plans for integrating technology into classroom instruction often reduce or abandon them" (p. 490). In general, teachers who face too many technology or troubleshooting-related issues will not include technology in their classrooms.

For example, Anne mentioned, in her first interview, an issue she had using software that day. She had a video in Google Classroom that she wanted to use but could not figure out how to play it. She said, "I had added a video that I wanted to use to Google Classroom. And it never, like, I even clicked on it and made sure it opens, 'cause sometimes, it won't, necessarily, link right, with YouTube, or whatever." Although she thought she did everything necessary to load and play the video, the video did not save. While Anne did not give up on this video, she did have to go online during class to find it, using time she did not plan for. "Then I was kinda like, I have to find that. And then, you know, it just takes longer," she said. As Sandholtz and Reilley stated, "This focus on technical issues delays teachers' progress in using technology in meaningful and productive ways in their instruction" (p. 507). While I was talking to her, Anne seemed exasperated about the event, even after the fact. She thought that she had done everything correctly, taking away any need to troubleshoot during class, but with no success. She had focused so much on the issue that it kept her from moving past it.

Anne was able to troubleshoot her issue, but it was one she did not expect to have to deal with.

Doe mentioned several examples of having to troubleshoot technology. Doe found not knowing how to figure out a solution "frustrating." They would use their experience troubleshooting the issue to describe the steps they took when asking an educational technology coach or the technician for help. For example, Doe said, "My smart board isn't working. It's doing this. How do I fix it?" Like, I always try to do that before I email like, you or [the technician]." In trying to figure out the issue, Doe said that they "get a little stressed out" when things do not work as planned. One thing Doe did learn was that students can be helpful in the troubleshooting process, too. Doe said, " 'Cause they have the technology in all of their classes and they see different teachers use it in different ways. So, I learn from them, too." Doe went on to explain,

> One good thing about having like kids who know so much about technology is a lot of times they can help me troubleshoot, which is, you know, if I'm doing something on the board or whatever, they can be like "Oh [teacher's name], you need to do this."

Doe's thinking aligns with Ertmer et al. (2012), when they stated,

> One way to reduce fear is to provide teachers with ideas about how their students can assist them with technology. Several of the teachers in this study indicated that their students taught them new ways to use technology and were able to troubleshoot technology problems. (p. 434)

Using the students, the school technician, and an educational technology coach were all resources Doe mentioned in helping to solve problems. While they may not always know how to solve a problem, Doe did try to fix it before reaching out for help. Doe stated that when they did reach out for help, they could, "be like, 'I've tried to troubleshoot this. Here's what I came up with'." Doe was looking to be proactive in solving problems. Doe tried to utilize the support available to overcome this first-order barrier.

John had several examples of troubleshooting both hardware and software issues. He, too, tried to be proactive in fixing hardware issues. If he needed to involve the technician, he would send students down to that department. He remarked that "sometimes I send them down and they come right back. 'He fixed it'[students would say]. And I'm like, 'Ok. Great. What'd he do?' " His reason for this was to learn as much as he could to improve his troubleshooting abilities, or as John said, "so that now I can do it. You know?" John, like Doe, was trying to remove the barrier in his way to successful technology integration.

John also tried to troubleshoot software. He mentioned during both of his interviews issues with logging in to specific websites and how he and the students navigated the issues. John had to determine how to address issues during class to ensure students were getting both the instruction and help that they needed while he was troubleshooting issues. He described how he worked with students to help them with technology issues:

> You know, you have to make a decision: "I'm gonna get through these directions. You sit tight. Let me get the 28 other kids going and then we'll

take care of you."…[I] take this hat off, put that hat on. And, you know, you learn tricks along the way.

John had to take his teacher "hat off" to help troubleshoot student issues. In this situation, the troubleshooting process took away from the instruction he was trying to provide. This provided John with more to do in addition to his lesson. John worked to overcome this barrier, but having to take time away from teaching to help with a technology issue was not something he planned. This prevented him from implementing the lessons as planned. Likewise, he also had to help students get through software issues. One program that he wanted to utilize, since he had implemented it successfully in a previous district, was not able to be used. Although he and the students tried, login issues and rostering problems made them give up. He said "half the kids couldn't use it. So, I just stopped, because it was more of a nuisance than anything else." The time involved in trying to troubleshoot issues and figure out solutions could require more time and effort than the teacher could spend. Technology integration cannot be a deterrent to teachers, or it will never be implemented successfully. Teachers who are discouraged by first-order barriers will be less inclined to invest in integrating it. Those who are able to bypass or overcome these first-order barriers will be more likely to implement technology integration successfully. As Blackwell, Lauricella, Wartella, Robb, and Schomburg (2013) stated that teachers "more in favor of technology or more open and willing to try it are more likely to adopt technology in their classroom" (p. 311). Those who have a negative attitude

towards the implementation, due to time, effort, or other first-order barriers, could give up on the technology integration and move away from it.

Theme 2: Teachers' Positive and Negative Experiences That Enable or Prevent Technology Integration

This theme identifies participants' experiences—both positive and negative—when integrating technology and how those experiences enabled or prevented them to include more technology. Al-Awidi and Aldafeeri (2017) stated, teachers' "attitudes, beliefs, perceptions, and behaviors toward technology play a significant role in their adoption of technology" (p. 120). The beliefs teachers have about technology in the classroom, the perceptions of how it enhances learning, as well as their perceptions of their own abilities to implement technology impact integration (Inan & Lowther, 2010).

Vongkulluksn, Xie, and Bowman (2018) found that the importance of or the value of the beliefs teachers have about technology integration are directly tied to the success of that integration. When teachers feel that technology is playing an important or useful role in their teaching, they will do a more successful job of integrating it into their classrooms (Barbour et al., 2017; Ertmer et al., 2012; Mueller et al., 2008). Positive experiences with technology can determine how teachers proceed with future integration and how they see the success or failure of past lessons.

Positive aspects of technology integration. As stated, teachers' perceptions of technology impact its integration. The teacher-participants in this study had positive perceptions of technology and its integration. They noted several positive aspects of technology integration. For example, Jane identified that a positive aspect to technology integration was that "the students are engaged." Doe, too, stated that the use of

technology was helpful in including students who were less inclined to speak out in class. Doe stated, "I think that it gives kids who are really introverted a chance to collaborate without having to like, talk." Both Jane and Doe identified technology integration as being important to students' futures. They expressed that teaching students in middle school how and when to use technology was a positive aspect with future benefits. Doe said, "They're going to be better able to use technology in high school and also, like, beyond." These are sentiments that Jane agreed with.

John expressed that a positive aspect of technology integration was the differentiation that could be used when implementing different tools. He said, "There's so many different ways that you can teach or use as a resource." One of the sections John taught was a special education push-in class. This type of class was one in which students with identified special educational needs and their teacher joined with a mainstream class. John was able to use technology to differentiate lessons and reach the educationally diverse learners and students in his room. For example, those students who were more comfortable typing their responses than writing them could. Those students who were not able to type their papers had other options. With tools like Flipgrid, he could have students just speak their responses to questions privately, without the entire class watching them present their knowledge. Anne's thoughts were in line with John's. She said technology "brings the world to the classroom. It gives 'em more…gives them more opportunities, more ways of learning."

The teacher-participants in this study were, overall, positive in their views about technology integration. They saw the benefits of using technology and the impact it could have on students. These perceptions were helpful to them when trying to overcome

any second-order barriers. In terms of their beliefs about teaching, computers, classroom practices, and their willingness to change, the second-order barriers were not issues for the participants due to their positive outlook on technology integration (Ertmer, 1999). Because their views on and beliefs about technology integration were largely positive, they were not very resistant to trying new tools in their classrooms and integrating the technology when they could.

Success with technology. Success with technology was an area the teacher-participants discussed during both of the interviews they took part in. The experiences the teacher-participants had when integrating technology in the past had an effect on their willingness and openness to try different tools or programs during this study and in the future. Each teacher was asked to describe a time they were successful in using technology in the classroom. During the first interview, the teachers answered hesitantly when answering about times they were successful using technology. Anne's initial answer was that she could not think any successful lessons. She was much more capable of providing an example of when a lesson had gone poorly. Anne did mention that a successful lesson was when students were using a PowerPoint or Prezi to give a report. When asked during the second interview about a successful lesson, Anne immediately mentioned the Quizizz lesson she implemented during the study. During the first interview, Doe's initial answer to the question about an example of a successful lesson was "I don't know." Because we had had an informal chat about that day's lesson before the interview, I prompted Doe with a mention of that same day's lesson. Doe then described the research project students had been working on that day. Doe showed a video on a topic of the project and modeled for students how to use different tabs to

compare and contrast research sources. When interviewed for the second time, Doe's immediate answer was, "I feel like I use it, like, all of the time." Doe was much more verbal about their uses of technology. The lesson Doe described was similar to the first one they implemented with a video and a mini lesson. But Doe was much more confident in their answer. During Jane's first interview, she mentioned a Flipgrid lesson that she had recently done that went well, as well as a Prezi lesson that she used years before that she felt was successful. During the second interview, she instantly identified the social justice project she had done. Several of the tools presented during our professional development sessions were used as a part of this project. Photostory and Emaze, specifically, were tools her students used. She said, "I felt like that was a success, because the students learned how to use it and could use it on their own." This was a current project that she had done and felt good about. John, during the first interview, said his mind went blank when asked for a successful lesson. He then remembered that he was having students use Google Classroom to complete their bell work assignments. In the second interview, John mentioned, "Well, we did pretty good with the game that we had. Flipgrid was a 50/50. Um, I know I've already had the success with like the, the Read Theory and the NewsELAs." John had more substantive technology integration examples at the end when he reflected on successful technology integration lessons.

The teacher-participants all had positive experiences with technology in the past. This was evident in the participants' willingness to be a part of this study, answers to the first interview questions, and openness to trying new technology tools and programs. Throughout the study, the teacher-participants found success in using technology in their

classrooms. The teacher-participants' beliefs about technology integration were impacted by these positive implementations, as evidenced in their second interviews. When asked about successful lessons using technology, three of the teachers identified lessons that were created during this study as having been notably successful. These experiences, both past and present, were important because they helped teacher-participants see the benefits of both professional development and technology integration.

Negative integration experiences. While reviewing the qualitative data collected during interviews, observation notes, and teacher reflections, several of these second-order barriers were identified as negative integration experiences by participants. Hew and Brush (2007) identified, "The lack of specific technology knowledge and skills, technology-supported-pedagogical knowledge and skills, and technology-related-classroom management knowledge and skills" (p. 227) as barriers to technology integration. The negative experiences identified by participants break down into five subcategories: (a) classroom management, (b) student off-task behaviors and distractions, (c) preventing technology use, (d) teacher lack of knowledge, and (e) overwhelming. These subcategories were all factors that played a part in teachers' abilities to enable technology integration, or they worked to prevent technology integration. Each is described in further detail below.

Classroom management. Durak and Saritepeci (2017) identified five dimensions of classroom management: "management of physical structure of the classroom, teaching management, time management, management of intra-classroom relationships, and behavior management" (p. 443). In their interviews, several of the teacher-participants mentioned classroom management issues involved with the integration of technology into

their lessons. Doe, for example, identified the way their classroom was physically arranged so as to improve the usage of technology. Doe said, "I kinda set up my room thinking I wanted as many desks on the wall as possible. And that's intentional, so that as many of them can charge their tablets as…possible." Doe's interest in the physical layout of the classroom had the students' and their devices in mind. Students' with laptops that were not charged could not participate in some of the lessons. Doe set up the classroom as a way to overcome that problem. John identified an issue with classroom management relating to the behavior of students. Students being off task was an issue in his classroom. He stated, "I'm only going to say so many times get off the YouTube videos." While Doe was able to rearrange the classroom to accommodate the students, John's management issue was not as easy to solve.

As Hew and Brush (2007) note, "The changes in a classroom environment caused by the addition of technology often lead to an even higher level of unpredictability" (p. 238). Doe mentioned classroom management issues directly in their classroom. Doe reflected on their experience using Photostory in a class I was observing. Doe expressed that it did not go well. "It [the Photostory lesson] was really difficult. And, it was purely due to classroom management issues. Um, because that class is extremely hard to keep on track," they said. Doe said that the classroom management became an issue, "because…if they don't immediately know how to do something, they don't pay attention at all." The unpredictability that can come from using a new tool or technology can provide a need for both teachers and students to know and use clear classroom rules and procedures. Implementing rules and procedures were helpful to John and Anne during their integration. Both described instances when students had to be redirected away from

sites with games or YouTube. When coteaching in Anne's classroom one day, I had to redirect a student several times. He was using his tablet to play an online soccer game instead of the quiz review game the class was doing. While he was compliant each time, whenever downtime was present between games or when the teacher was reviewing the answers, he was trying to play online. Classroom management, especially off-task behavior or behavior issues, was a problem for teacher-participants when integrating technology. Having to redirect students or vying for a student's interest against YouTube or online games caused teacher-participants to have negative perceptions about technology integration.

Student off-task behaviors and distractions. Negative aspects of technology is a subcategory that focuses on those aspects of technology and its integration that teachers in the study identified as being undesirable to students or teaching. As Storz and Hoffman (2012) found in their study about with the addition of one-to-one devices to a school, "There was more off-task behavior that was more difficult for teachers to monitor" (p. 15). The teacher-participants in this study also found that the integration of technology increased off-task behavior in several ways. As English teachers, Jane and John both had somewhat negative opinions of students reading online. When asked during an interview about a negative aspect of technology, Jane responded, "Although students prefer learning, and maybe reading, online, um studies show that they're not actually comprehending as much typically." John, similarly, stated, "I'd rather them read a book than actually read on a device." These teachers were less inclined to use technology during reading because of their beliefs about its detrimental effects.

Doe, Anne, and John all identified a second negative aspect to technology integration. They mentioned the effort it took to keep students on task when using technology. While this does tie into classroom management, the teachers specifically mentioned it as a negative aspect to technology integration. Doe said, "They've got games and got everything else on it that distracts. And that frustrates me." Likewise, Anne and John both mentioned this issue in both their first and second interviews. John said in his second interview that a negative perspective to integrating technology was that "the kids still bypass everything to get into games, and their focus is on some other stuff, like YouTube." Anne similarly said, "It's hard to monitor what the kids are doing when they're on their computers. I had tons of kids that said, 'Oh, I'm doing a [n online classroom-based English lesson] NewsELA [assignment]'. And, they weren't doing NewsELAs, because, you know, two weeks later they still hadn't completed one." Keeping track of what each student is doing on their device can be a daunting and frustrating task for teachers. The teacher-participants in this study found that the integration of technology can negatively impact students' comprehension and their ability to stay on task in the classroom. While students appeared to be busy and working, the teacher-participants had several instances where they found students to be off-task.

Preventing technology use. During their interviews, teachers were asked what prevented them from using technology more than they currently do. All of the participants responded to this question. Anne's answer in both interviews involved not having the technology needed to create art. She identified art content standards she needed to teach, where the professional development training we did was helpful, but she always came back to the idea that none of the professional development addressed

creating art. The lack of content-specific technology tools prevented Anne from implementing technology projects into her classroom. This negatively impacted her perspective about technology integration, as she expressed that she did not have the tools needed to be successful. Doe identified the time needed to ensure students' knowledge and understanding of the software prevented them from using technology more. Doe said, "Worrying that they don't know how to do things, or they don't know how to use things. Um, like, we just typed an essay and it felt like I had to spend so much time." John identified his lack of knowledge as a preventing technology use. He said, "I guess you could say fear, because of lack of knowledge [laughter]. Not ready to use it. Especially with these kids, because a lot of them are tech savvy."

Jane's response described her avoiding technology. In her first interview, she described students not knowing how to turn in an assignment on Google Classroom. She said that students not knowing how to use programs that she wanted to use was a hindrance for her. She stated that it became easier for her to just forego technology and collect handwritten work.

Teacher lack of knowledge. Teacher lack of knowledge is not limited to basic technology skills but includes knowledge about content, pedagogical methods to enable student learning, and ways technology can aid in implementing those methods (Ertmer & Ottenbreit-Leftwich, 2010). All of the teacher-participants provided evidence in their interviews that related to their lack of knowledge about technology integration. Jane identified her fear of "falling behind." She noted, for example, that she had never used the formative review program Kahoot before this school year. In terms of the professional development sessions, she said, "I think it's really good that we have that

and it's something that's important to me because I don't want to fall behind." Having been an administrator and then completely out of the classroom made her worry that she was not as up to date on the technology as other teachers or the students. Anne stated that her lack of knowledge in content-specific technology integration made for a negative integration experience. She said, "I don't know enough about how to produce art through technology." Her lack of knowledge and her inability to share art creation tools with students kept her from implementing more technology in her teaching.

Doe described themselves as a "creature of habit." Doe was comfortable with what they were already using and were hesitant to try something else in their teaching. Doe said, "I'll do things the same way. And with technology, as well, like, you know, I use Google Classroom for everything, but I don't tend to use a lot of different stuff." They did state in their first interview, though, that "I do think that I could do more."

John identified this issue as an issue that prevented technology use. In the first interview, he stated that, "because of my lack of knowledge of [technology], they're [students are] going to figure it out better than me and take advantage." His fear came from the students catching on to the technology or knowing about more than he did. John's lack of knowledge negatively impacted how he integrated technology.

Overwhelming. Jane and Doe both identified that technology integration can become "overwhelming". Doe said, "There are so many different options out there that they can have assignments and submit 'em that sometimes it becomes difficult." After a professional development session, Jane would take time to reflect on what was being discussed and how it could be used in her classroom. She would try to find a good fit for the technology. She said, "Sometimes it's a little overwhelming for me because there are

so many—again, there are so many different things I could do….I just don't know where they would fit best." Doe also mentioned how much was involved in integrating technology, especially with students. Doe said, "It can just be a little overwhelming sometimes to try to teach all of them how to do something new. Um, because their attention spans are kinda short, and they will just get off track."

Because there was so many tools and programs available to teacher-participants, deciding which to use, when to use them, and how to introduce them to students became, at times, overwhelming. This had a negative impact on participants' perceptions of technology integration. The idea of not assigning work to students using technology was appealing because it was simple. The students were accustomed to handing in their work, and, as Jane commented, "because it's easier for me to just take it from them." Teacher-participants and students were comfortable and familiar with paper assignments. If the inclusion of technology became overwhelming, this was easier for participants to fall back on to get what they needed from their students.

Theme 3: Teachers' Perceptions of Their Current Practices, Readiness to Integrate, and Future Plans for Integration

This theme represents how the teachers in the study viewed their integration of technology into the classroom and how they perceived the second-order barriers they had. Ertmer (1999) described second-order barriers as those which "interfere with or impede fundamental change" (p. 5). While the teachers who took part in this study were not afraid of integrating technology, they did have some fear of change. Each teacher reflected on their lessons, planning, and aspirations for technology use as they progressed through the study. The teachers also discussed how ready they felt to implement the

technology they had learned into the classroom. They evaluated these points in the interviews we completed. During the first round of interviews, the teachers gave an initial personal assessment of how they were using technology in the classroom. During the second interview, the teachers examined the lessons they had completed, reflecting on the tools they learned and how they felt the technology was integrated and executed. As the study evolved, so did the teachers' willingness to implement the changes necessary to improve their understanding of technology integration.

Each teacher worked to insert the technology tools they chose to try into their content-based lessons, giving the technology a better chance to become a part of their teaching and not just something they tried because they were asked to. Keengwe, Onchwari, and Wachira (2008) wrote, "Rather than viewing technology as merely a tool for delivery, it should be seen as a means to improving learning" (p. 563). The teachers in the study used the technology to improve students' learning. The teachers implemented the technology learned during professional development sessions in ways that made the tools relevant parts of lessons. They found ways to add the technology into their lessons that supported learning objectives and increased students' attentiveness to the topics. Several teachers spoke during their interviews about the engagement students showed in lessons using technology tools. The more comfortable they felt, the more ready they became, the more technology the teachers used.

The school administration and staff also worked to make sure that the technology was not an afterthought, but a building block teachers were ready to use to improve student learning. Administrative encouragement and professional learning communities focused on technology integration and the benefits it could provide. This helped to

improve teachers' readiness and current practices in using technology. Knowing that using technology was encouraged and trial and error was allowed gave the study's participants the freedom to try new things without fear of failure. This helped them to build knowledge and confidence with technology and increased their perceptions of readiness. The remainder of this theme addresses (a) experiences, (b) readiness to integrate technology, and (c) future plans teachers have for technology integration.

Experiences. Experiences teachers have using technology can determine future technology usage or their willingness to try new things with technology integration. Several authors identify teachers' beliefs about technology's role in education and their own abilities to integrate it successfully as integral to successful technology implementation. Belland (2009) states, "If teachers believe that technology should be integrated and that they can integrate technology, then technology integration will happen" (p. 354). Early interactions with technology can create a foundation of positive viewpoints towards technology or those of mistrust and negativity. Persuasion will not change negative beliefs once they have set in (Ertmer, 1999). Positive experiences, too, can be hard to change, too, because of this. Teachers' understandings of their own readiness to use technology and how technology plays a role in their current practices can be formed each time they try a new tool and have success or failure using it. The teacher-participants' experiences are further expressed by their current preservice experiences.

Current. Inan and Lowther (2010) found that an increase in teacher readiness, beliefs about technology integration, and technology availability had a direct, positive impact on technology integration. For example, Jane had a positive experience using Kahoot during a district-led professional development session. She had not seen this tool

before, but she felt that it was one that could be integrated well into her classroom. Because she had a positive experience with this tool during training, Jane was willing and excited to use it in her classroom. Like Jane, Doe also recalled positive experiences with technology integration that influenced them to continue using it. During student teaching, Doe had positive experiences and encouragement when integrating technology. Doe recalled that in their courses "[We] were like strongly encouraged to use technology. And also, like, some of the teachers that I worked with like were already using it, and so, it was easy to learn that." This positive interaction with technology, combined by the encouragement of professors and cooperating teachers helped to make Doe very willing to learn about technology integration. Doe was introduced to Google products during student teaching. Doe stated, "I use Drive for everything. And I use YouTube for everything." Doe maintained a Google Classroom for students and posted documents, weblinks, and videos to it often. Doe also used YouTube videos in the classroom to help students understand topics. Doe said, "we watch a lot of, like, 'Crash Course: US History'." Because of the background Doe had from student teaching, they continued implementing the tools they learned as they grew into their career.

During our interviews, the teachers stated that they used some form of technology in their classrooms each day. For example, when asked how often he uses technology, John asked if the interactive white board counted, " 'Cause that's on every day [laughter]." Doe, too, stated that "I use my board every day." Anne said that she uses "A PowerPoint presentation, that is my slides that I use every day with the kids, to do their morning word and all that." The technology may have only been the interactive white board, but it was still an integral part of their teaching. The experiences these teachers

were having with technology during the school year, especially with the addition of the new interactive white boards, was creating a positive impact on their perceptions of technology integration. Because they felt supported in their technology usage, excited to use the new interactive white boards, and confident in their technology inclusive lesson plans, the teachers' readiness to use technology increased.

Preservice. Three of the teachers in the study mentioned having used technology in their preservice teaching. As stated previously, Doe used Google Classroom during student teaching. Jane stated that she had been using technology since her undergraduate training, and Anne mentioned using Microsoft PowerPoint while in school to become a teacher. Because of this years-long experience, these teachers were more positive towards the idea of integrating it into their lessons. They were open to the tools shown during whole-group staff professional development, and they were quickly had ideas about how the tools could be incorporated into lessons during our one-on-one sessions.

Readiness to integrate technology. Petko, Prasse, and Cantieni (2018) noted that teacher readiness to integrate technology was based on the school's readiness to integrate technology. They identified specific aspects that made up a school's readiness. These included the value the school places on educational technology, outcome goals for integration, administrative support, infrastructure, and the interactions of colleagues regarding the technology and its integration. The teachers who participated in this study spoke during their interviews about their perceptions of how ready they, personally, felt to integrate technology and of any impact the school's support may have had on that perception.

Second-order barriers, like the confidence teachers have in their ability to use technology, beliefs about students and how they learn with technology, and the value of technology in the learning process (Ertmer, Ottenbreit-Leftwich et al. 2012), have an impact on teachers' perceptions of their own readiness to integrate technology. The more confidence they have, the more ready they will be.

During Doe's first interview, we discussed the process that would be followed for the professional development. I mentioned that there would be whole group professional development with their team, one-on-one professional development that would be more focused on Doe's classroom and needs, and a modeling of the tool for students and the teacher so that there was real world experience given before Doe would have to teach using the technology. When asked if they felt more ready after all of the professional development, Doe said, "You talking about, like, modeling it for me, like with kids, that makes me feel way more [ready]." They said that they would be ready "because, it's one thing to have it explained in a group of adults, and then, a completely different thing to have to try to do it with kids." The modeling piece of the professional development was one aspect that helped Doe to feel more ready to integrate technology. During their second interview and after completing the study, Doe's answer did not change. They said, "I would say it [technology professional development] makes me feel more ready." They continued, saying, "I mean, I feel pretty ready. I tried to try more new things. I feel like I have tried a lot more new things this year." Anne and Jane also stated that the professional development routine helped them to feel more ready. Anne replied, "Oh, yes. It [technology professional development] definitely helps." And Jane said, "Stuff like that helps because I was introduced to a bunch of… different classroom options that I

did not know about or haven't used before. So that was helpful." The implementation of the professional development helped these teachers to get past any second-order barriers they may have had with regards to their ability to use technology.

Another part of the second-order barriers that was mentioned was the school's support for technology integration. The opportunity for teachers to have monthly technology professional development and to have access to technicians and technology coaches in their building—all helped the teachers to feel supported in their integration of it. Doe said that the emphasis on professional development, "makes me aware that that's what the school wants us to be doing." Doe added, "A lot of schools that don't really emphasize technology like that." John, having come to this school from one that was also supportive of technology implementation, said that he was already using technology in his old school, so the transition was one that he felt comfortable with. He did not have a learning curve with technology integration but rather had to increase the amount he was using. He said, "I just had to get used to the new programs." Having had the encouragement to use technology in the classroom in the past, John expected to use the use it when he began at this school. He was ready and willing to learn new tools when he began. Google classroom, for example, was a tool that he was not familiar with from his past schools, but was learning in his new role. Jane, however, was not as ready as John. She began a new school year at a new school with the fear of already being behind in her technology knowledge. Because of experiences she had in her previous school, she was not used to the availability of professional development on the technology either. She said that she had not "had that at other schools." While John had a predetermined idea of how important technology integration was on his teaching when he began the year, Jane

grew in her understanding of technology integration, as did her readiness to use it.

The teachers in this study all had positive impressions of technology integration when it began. As the study progressed, however, they began to use more technology in their classrooms and to try new things. Professional development can alter perceptions about technology integration (Tondeur et al., 2017). At the beginning of the study, the participants were not opposed to technology integration, but all were somewhat timid about trying some new things, no matter their previous experiences. However, because the school was a one-to-one device school, because technology integration was encouraged by the administration, and because support was available on site as needed, the teacher-participants had the means in place to effectively begin to use technology more within their classrooms. Their perceptions and fears associated with trying new technology tools changed as they progressed through the professional development sessions. All of the teachers in the study said they thought the professional development was helpful to increasing their readiness and integration of technology into the classroom.

Future plans. Teachers' perceptions of readiness can be vital to technology integration (Inan & Lowther, 2010). As the teachers in this study stated, they felt ready to integrate technology. A couple of the teachers went so far as to mention how they would like to continue integrating technology in the future. This planning indicated that the teachers had begun to view the technology they were implementing as more than just a means for delivery of information, but as an integral part of student learning.

For example, Anne mentioned several future implementations she would be interested in. One being the use of "[Adobe] Photoshop, or something like that," to help students use technology to create art. Another would be the inclusion of cameras for

artistic work. She also mentioned as was stated previously, that she would like to try a flipped classroom model, using the Teaching for Artistic Behavior model. While Anne had the hardest time implementing tools learned during professional development into her content area, she was very hopeful about being able to do more in the future.

John mentioned wanting to use an online catalogue system in his classroom as a way for students to check out books from his classroom library. He had tried it in the past with some success and wanted to integrate it in a more permanent way. As described above, John was hoping to track the books students checked out. He was also interested in the autonomy this would provide students regarding what they read and how he could manage his library in a more efficient way.

Doe, too, looked towards the future during their interviews. Doe spoke about their interest in doing more collaborative work with students in the next school year. Doe said,

> I feel like this year I got a really good idea of sort of like what [my students'] level is, as far as like, what they know about technology. What they can do, what they can't do. Um, and so now I have a better idea going in to next year of, like, what I need to show them how to do, and what I don't.

Doe was planning at the end of a school year for the projects and lessons they wanted to try in the next. As they felt more comfortable with technology and the access they had to technology and training, they exhibited their readiness to try new things in the next year before one year had ended.

Overall, the teachers in this study moved beyond the second-order barriers that may have kept them from trying new tools and integrating technology due to their perceptions of readiness to implement. The professional development plan that was put into place during this study helped to build confidence in the use of technology and knowledge of what was available to be used.

Theme 4: Teachers' Perceptions of Technology and Technology Integration for Students

As has been stated, teachers must be comfortable and confident with the technology when integrating it for it to be successful (Keengwe, Onchwari, & Wachira, 2008). Teachers also need to feel confident and comfortable in their students' abilities to use the technology integrated successfully. Because today's students were born into the digital age, it is often concluded that they are familiar with technology applications. Smith and Chipley (2015) found that this is not always the case. They expressed a need for teachers to model new technology and digital tools for students to show their meaningful uses (Smith & Chipley, 2015). Today's students need the same teacher modeling and instruction in technology as did those in the past.

This theme was not a direct focus of the research. But teacher-participants mentioned the topic warranting its inclusion. This theme describes perceptions participants held about students' knowledge of technology and integration into classes.

Lack of knowledge and discrepancies of knowledge. The teacher participants in this study had certain expectations of their students. They took for granted, at times, that students were familiar with different technology tools and ideas because the students were born into a technology-rich world. At times, even simple tasks, like logging into a

website, were more challenging than the teacher participants had planned. John experienced this several times. He commented in an interview that some of his technology issues happened because, "They just weren't logging in properly. Which was usually the case." He continued saying, "I kept telling them, 'Don't log in through Google in Read Theory.' " The students' lack of knowledge about a technology tool led the participants to have to alter their lesson plans to accommodate the students. For example, Doe said,

> That frustrates me. Um, worrying that they don't know how to do things, or they don't know how to use things. Um, like we just typed an essay and it felt like I had to spend so much time, like, this is how you open the document.

The added work teacher participants would have to do to teach students how to use the technology was, at times, not as important as the lesson they wanted to teach. Doe said, "Sometimes there's a lot of stuff that I think they'll know how to do, and then they don't, and then I just get frustrated. And I'm like, never mind." In this instance, Doe decided against using technology in favor of moving the lesson along. Student lack of knowledge can be a drawback for teachers who want to use technology in the classroom, but who do not have the time in their unit to teach the tools.

Opportunity. During their interviews, two of the participants mentioned the different opportunities technology integration can provide for students. The participants mentioned that students would be able to benefit from what they are learning in their future educational and career endeavors. Doe said, "I do think it's really important for actually preparing them for…next steps, like, preparing them for high school, preparing

them for college, preparing them for the workforce." Doe continued, "'cause you're going to be expected to know how to use technology." Jane, also, felt that using technology was giving students opportunities to improve their futures. In her first interview, she said, "I want the students to be doing what's new. I want them to go to high school and college being up to date on what they're using there." These feelings continued. In her second interview, Jane reiterated her sentiments, saying,

> I think it's important because we have to make sure that our students aren't behind when it comes to technology, um, in high school and careers. .

Because students were interested in and engaged by technology, teacher-participants and students all benefitted from technology integration. In her study, Gönen (2019) found that both students and teachers saw the value in lessons that had technology integration. Also, they found that both groups became more aware of how technology could be better integrated after taking part in the study. These technology skills will serve both the teachers and students well in the future. Doe agreed, saying that they were teaching the students life skills when using new technology. Doe said, "I see it as an opportunity to teach them how to not let things distract you. Or how to use this as a reward for yourself." Teacher-participants saw that the skill of technology was being integrated into their lessons would be impactful for students in the years to come.

Distracted by technology. While two of the participants mentioned the opportunities technology integration provided students, *all* mentioned the distraction technology posed. The participants expressed the frustrations and challenges with classroom management when integrating technology. Also, Anne found that integrating

technology that did not align with her curriculum to be difficult. Because she had to integrate reading into her art class, Anne used NewsELA. As she was not a reading teacher, and had larger classes, it was difficult for her to integrate the technology successfully. She said,

> It's hard to monitor what the kids are doing when they're on their computers. I had tons of kids, kids that said, 'Oh, I'm doing a NewsELA', and they weren't doing NewsELAs, because, you know, two weeks later they still hadn't completed one. So, [Laughs]."

Monitoring students' technology use can be a difficult aspect of classroom management to conquer. Erdoğan, Kurşun, Şışman, Saltan, Gök, and Yildiz (2010) noted that students' off-task behavior was an often-mentioned discipline and management issue in teachers' reporting of classroom issues. Erdoğan et al. (2010) also noted in their research that "solutions to these emerged problems were not frequently spelled out" (p. 889). While walking around and looking at student devices during lessons, as the school district recommends, can be a helpful way to keep on top of what students are doing online, it cannot be completely effective. The participants in this study expressed frustrations by the amount of time students were distracted with technology. This was evident in the tone of voice John used when discussing his students' distracted behavior. Exasperatedly, he remarked, "With the kids on one-on-one [devices], it's a constant struggle to get them off of things like games, instead of where they should be." This sentiment did not change from the first to the second interview. Doe, too, mentioned that students were not always on task in class. Doe said, "They have different things on their tablets that they, you know, that distract them." The perceptions teachers had of

technology integration were partially formed by the way students reacted to technology usage in the classroom. While most teachers were interested in implementing technology, they did not have time in their class periods to deal with the classroom management issues that could arise from it (e.g., off-task searching, and watching videos online).

The participants also discussed difficulties with keeping students focused while using technology. Doe expressed technology could be helpful but also a distraction. During an interview, when asked what prevented usage, Doe said "Just feeling like they won't focus on it. And, um, you know, they've got — I don't know if they're supposed to or not — they've got games and got everything else on it that distracts. And that frustrates me." In their second interview, Doe still was uneasy with technology integration because of the distraction it could pose to students. Doe said, "it can just be a little overwhelming sometimes to try to teach all of them how to do something new. Um, because their attention spans are kinda short, and they will just get off track."

Three of the participants discussed the frustrations and difficulties with monitoring students when integrating technology. Doe, however, also recognized and acknowledge managing technology was student responsibility, too. Doe did have a positive thought about the distraction technology could pose during their second interview. Doe said, "I see it as an opportunity to teach them how to not let things distract you." They continued, "I feel like that's part of our responsibility, as their, as their teachers is to teach them how to not let that distract them. That's, that's just one of the many skills that we're teaching them." John, too, had trouble keeping students focused and off of distracting websites. In his second interview, he said that a negative

aspect of technology integration was that, "the kids still bypass everything to get into games, and their focus is on some other stuff, like YouTube." He continued, jokingly saying, "So, I guess, if I can utilize YouTube better, I'd be doing okay."

Because students were distracted by the technology available to them, teacher participants had a more to overcome when integrating technology. Some had more of a negative attitude about using technology in their classrooms, due to the effort it would take to keep students off of the wrong sites. As John comically mentioned above, the participants felt that if their lessons had to compete with YouTube, for example, they would not win.

Dependent on technology. Students' dependency on technology was not mentioned often during the data collection, but the two instances were notable. Jane stated in her second interview that a negative aspect of technology integration was the dependency students seemed to have on technology. She said that they "can't think for themselves" because of it. When discussing the research students had done, she mentioned, "They use technology to look up anything. Anything." This was important to Jane. She spent a large portion of the semester teaching the students to do research and to think critically about a topic. Her technology integration lessons were largely using tools for presentations, so that students would be able to have options when presenting their research. She was frustrated by the lack of critical thinking students showed; that they were so dependent on technology they looked up the simplest facts online without trying to reason out answers or trust their own memories.

Doe, too, mentioned the students' reliance on technology. They saw this more in the learning of new technology, though. Doe said, "I feel like a lot of our students have

sort of this, like, learned helplessness. Like, if they don't immediately know how to do something, or if something is not immediately user friendly, they're just like 'Nope.' " Doe wanted students to be willing to try new things. Doe was interested in using new tools but was afraid the students would be intimidated by the tools or disinterested by the tools and give up.

Both participants expressed that technology was almost a crutch for students at times. Because they mentioned students' dependency on technology and the effect dependency could have on students was an interesting aspect to how they saw technology integration and the attitudes they had towards it.

Engagement. While there was not a lot of data collected on the topic of engagement, this category was important to include, because it showed that although students may be distracted by the technology or dependent on it, they were also inspired by technology and interested in using it. This is an important point to include, as it shows a balanced view of the technology integration. Much of the findings in this theme are negative, but this connotation does not accurately represent the experiences the participants reported overall. Including positive aspects that speak to the students' experience helps to provide balance to the findings. As Sheehan and Nillas (2010) found, students' use of technology integration resulted in increased understanding, engagement, and critical thinking. Moratelli and DeJarnette (2014) noted that "students enjoy and appreciate teachers' efforts when teachers incorporate technology into their lessons" (p. 588). The teacher-participants making an effort to use technology made students more responsive to the lessons and participants better able to track student progress. Jane, for example, mentioned, "A positive aspect is that it the students are engaged, and you can

constantly monitor your engagement in real time with some of those [Google Apps for Education] activities." Because she was integrating technology into her classroom, Jane found students were willing to do the assigned work, while she was able to monitor their work and collaborate with them, if needed. Anne, too, felt that technology integration engaged students who may shy away from art. She felt that there was a segment of students who were not confident in their drawing and painting skills but who may be willing to integrate technology into their art projects. She said, "I think [technology] that would grab kids that, you know, that would grab another section of kids." Doe liked the engagement that students showed when working with online tools. Doe used Google Classroom in their class as a place where students could find assignments, resources, and where to turn in work that they created, often in Google Docs or Google Slides. Students could work on these assignments together online. Doe highlighted the ability for students to work together while accommodating their different comfort levels. Doe said that students can collaborate "in more meaningful ways." Doe continued saying, "One thing that I really like, as someone who is really introverted, is that I think that it gives kids who are really introverted a chance to collaborate without having to like, talk."

The teacher-participants all spoke excitedly about the engagement students showed when technology integration was in place. These results validated Chen's (2008) assertion that, "Learning with technology can foster student understanding by engaging students in higher-order thinking, self-regulated learning, and collaborative or cooperative learning" (p. 68). Through collaborative work environments, new ways of creating, and real-time monitoring of student engagement using tools like Quizizz, the

teachers in this study acknowledged and developed students' engagement. The teacher-participants used this interest to the advantage of their lessons and for their students.

Theme 5: Teachers' Perceptions of The Professional Development, and Its Effects on Them and Their Technology Integration

This theme identifies the perceptions teacher-participants held for professional development they attended, as a whole staff and in one-on-one sessions, and the effects these sessions had on them, personally, as well as on how they integrated technology.

Thoughts and feelings towards technology integration. Throughout the study, there was not a comprehensive change amongst all of the participants about their thoughts and feelings towards technology integration. In the end, all of the teacher-participants were positive about their thoughts and feelings regarding technology integration, for the most part. The thoughts and feelings about technology integration, however, did change for two of the participants as the study progressed.

Jane's thoughts and feelings about technology integration changed the most throughout the study. In the first interview, she said that she thought it was positive, overall, but noted a need to be careful, too. She said, "I think we can't just do everything you know without having a hard copy or kids reading from a book. I still have the old fashion part of not using technology in my heart." Jane was open to the idea of technology integration, she saw it as positive, but she did not completely trust the integration of it into her classroom. Based on her want to always have a paper copy of a digital assignment or a physical book for students to read, Jane's trust in the "old fashion' " teaching was greater than her trust in the integration of technology. In her second interview, however, Jane said she thought it was important to integrate technology

because she did not want students to fall behind in their knowledge of or use of technology. She thought that students needed to know how to use technology in high school and future careers.

Doe's thoughts and feelings towards technology integration in the first interview were similar to Jane's. Doe felt that it was important to use technology to prepare students for their futures. Doe said, "I do think it's really important for actually preparing them for like, next steps." Doe felt that students would be expected to know how to use technology and how to manage their time using it, too. In our second interview, Doe's answer was reflective. They said, "I definitely feel like there are things that I could do better." Doe also started to transition their thoughts to future implementation, discussing how their current understanding of what students know about technology and what they can do with it. This showed that Doe felt technology integration was not only important but an expected part of their classroom.

Anne's thoughts and feelings remained largely the same throughout the study. During the first interview, Anne expressed her wish to do more with technology. She felt that it would be a way to reach students that may not be interested in traditional art, like painting and stenciling. In the second interview, when asked about her thoughts and feelings about technology integration, she had a similar answer. She said, "Oh, ya. I, like I said, I'd like to do more with it." She mentioned that even integrating a tool like Quizizz into her class was not a true integration to her, because the students were not using it to create art. While she was positive to the idea of technology integration, her overall view of it did not change dramatically during the study.

In both interviews, John mentioned that his thoughts and feelings towards technology integration were positive. His main concern both times was that students were easily distracted by the technology. He, like Jane, favored students reading paper books as a way to keep them engaged. While he thought technology integration was good, he did not want students to use too much technology. He said he understood how easy it was to get distracted by technology when reading, as he also has been "tempted to look at other things" while reading online. John was in favor of technology integration but in moderation.

While Anne and John did not have the same experiences as Doe and Jane with respect to technology integration, all of the participants felt that implementing lessons that used technology were positive and engaging to students.

Technology professional development and integration. The teacher-participants in this study took part in several types of professional development. They were introduced to technology tools through training sessions in their whole group professional learning communities. After this, the participants had one-on-one sessions to review the technology tool, ask questions about the tool, and plan a lesson using that tool. Finally, the participants taught the lesson that we had planned and I had modeled for them. Desimone and Pak (2017) stated the role of an instructional coach was to support teachers in learning contemporary instructional practices while still honoring the prior knowledge and belief systems the teachers hold about teaching. At the school where this study took place, the whole group professional learning community training sessions were the ones that were referred to as and considered professional development by the staff. While the one-on-one sessions and the modeling of lessons would also be

forms of professional development, the teacher-participants in this study largely identified the whole group sessions as the professional development.

John's opinion of the technology professional development and its relation to integration was similar in his interviews. He stated that he was okay with them in both, citing the need for time each time. He noted that if the subject of the professional development session was one of value to him, something that he could go back to his classroom and implement immediately, that it was more useful than one that he would not be able to use in a timely manner. Those he could not use promptly he would end up forgetting about. In the second interview, however, he maintained that the professional development was helpful, but time was still an issue. He said, "Like half the stuff we did I don't even remember now. 'Cause I didn't get a chance to actually utilize it." John expressed that it was important for the learning done in professional development to be adaptable enough that it could be applied in a timely manner for it to have the greatest impact.

In her first interview, Anne called the professional development "great," adding that the impact it had on integration was vital. She said, "If you don't know how to use it, you can't do it." While she did want for more subject-specific technology professional development, she thought that what she had learned was adaptable to her classroom. In the second interview, she stated that the professional development sessions were, again, "great," but she had issue with the timing of the meetings, as they took place during her lunch time. While she was interested in learning more about technology and how to integrate it into her classroom, she did not feel that the amount of time she had at lunch was long enough for her to learn a tool well enough to use it.

Doe's feelings about technology professional development were those of frustration. In our first interview, Doe said they felt that a majority of the time in the sessions were focused on areas they did not need help with. Doe said,

> Sometimes, like sitting through like, the first half of a technology PD and having to just sit there and like be expected to focus while people who didn't grow up with technology have certain things explained to them, I'm just like, "I'm very frustrated right now."

Doe was interested in more differentiation during the technology professional development sessions, so as to provide more specific training for those who were experienced in using technology and for those who were not. Since the whole group sessions were not differentiated, Doe admitted they said, "I'll tune back in when you guys get to what I need to get to," during them. As Doe's thoughts and feelings about technology integration became more positive, their self-efficacy grew stronger. Watson (2006) identifies self-efficacy to be, "a belief in one's own abilities to perform an action or activity necessary to achieve a goal or task" (p. 152). While not completely self-directed in their technology integration professional development, Doe became much more aware of their own needs in relation to the group. Some of the goals of professional development, according to Veenman and Denessen (2001), was for teachers to become more reflective, analytic, and self-directed. As the study progressed, Doe showed more of these qualities in regards to professional development and technology integration. Doe was more positive about the benefits of technology based professional development in the second interview, but they still felt that differentiation would be "super helpful." Doe continued, "I think that there are times when it would be more helpful if it was

differentiated based on, um, you know levels of comfortability with things." Because Doe felt more comfortable using technology, Doe felt that the whole group professional development sessions were lacking what they needed. The one-on-one sessions were more interesting to Doe. Doe was able to ask questions that they had as they occurred, without waiting for the rest of the group to be at the same place in the learning as they were. Doe was able distill the lesson down to the specific needs they and their students had. These one-on-one sessions, along with the modeling of lessons, were more helpful to Doe when identifying benefits of technology professional development.

Jane, though, felt that the whole group professional development sessions were helpful. In her first interview, Jane said that she thought it was "good that we have that [the whole group professional development]" so as to keep her from "falling behind." In her second interview, Jane still felt that the professional development sessions were helpful. She said, "It's good. I like it. It's helpful. It's relevant. It's not one of those PDs where you are sitting there thinking 'OK, I already —'….It's something I can use." Jane's fear of falling behind, combined with her interest in using the tools that were being demonstrated in the whole group sessions helped her to see the positive aspects of the professional development on integration.

Professional development. Desimone and Pak (2017) contend that professional development is more likely to be successful when teachers have the chance to practice what they have learned in a training and to get feedback on their implementation (Desimone & Pak, 2017). In this study, teachers were introduced to technology tools through grade level, whole group staff professional development sessions. After this introduction, teachers were given one-on-one training on the same tools. This provided

teachers with the ability to learn about the topic, formulate questions, reflect on how the tools could be used in their content area classroom, and devise ways in which to implement the tool. Teachers were also able to see the tools modeled for students during a class period. They were then given the opportunity to implement the tool themselves.

Jane had a positive reaction to the whole group professional development sessions. She said, "I realized how many programs I was unaware of. That I would not have been aware of if it wasn't for the, um, things that we did." Jane reacted positively to all of the professional development sessions. She sat near the front during the group sessions, and she was prepared and attentive in the one-on-one and coteaching sessions. John, too, was interested in the professional development. In his first interview, John was asked about the impact professional development had on his integration. He answered, "I would say a positive impact. I use some of the stuff." Similarly, in his second interview, John said, "I've seen teachers use what we've done. I mean, they've, they've tried it out. We tried it out." John was able to see the value in the professional development and the success others had when implementing what they had learned.

Doe, too, was positive about the impact professional development had on their teaching. In their first interview, Doe discussed that, while they were not implementing each tool immediately, they were learning and connecting the tools to their future lessons. Doe said, "Even if I don't necessarily end up doing it, I know that it's there. I know that it, you know, in the future, like, if I wanted to something like that, I know that it's there." Doe was able to take their learning and transition it to future lessons and projects. In their second interview, Doe answered the question about the impact of professional development on their technology integration saying, "I think it has helped me a lot. Um,

I mean, we've…we've looked at things in, like, tech PDs here that I've been able to then, like, use in the classroom." Doe felt that the technology professional developments, especially the one-on-one and coteaching sessions were positive learning experiences. Anne also found value in the professional development sessions. She said, "Oh, I think it gets people trying things." She continued, "It, at least, you know, shows them options. Anne went on to categorize the whole group professional development sessions as "kind of like a highlight reel." Anne felt this description described what she saw in the group sessions, which usually presented several tools for teachers to learn and choose from for their implementation. Anne was able to see several different tools during each session and the value they could bring to the classroom. From there, she could pick the one "highlight" she wanted to see again and work on it one-on-one in our individualized session. This was an interesting way to see and describe the group training. While not all of the participants felt positively about the professional development sessions, overall, they did all agree that they had a positive effect on how they integrated technology.

Chapter Summary

This chapter presented the four different types of data collected during this study. As this was a mixed-methods action research study, both quantitative and qualitative data were collected and analyzed to identify themes in the qualitative data. Quantitative data collection was performed using the TTQ. Qualitative data collection tools included interviews, observations, and reflections. Included in the qualitative data section are participant descriptions. This includes a description of each teacher-participant, a description of their lesson observations, and information about their experiences with the study. The data collected were analyzed and broken down into five themes. These

themes included issues with technology, teacher-participants' positive and negative experiences with technology, their perceptions of their technology integration and readiness to integrate, their perceptions of technology and of students' readiness to integrate technology, and the effect of professional development.

CHAPTER 5

DISCUSSION, IMPLICATIONS, AND LIMITATIONS

The purpose of this action research was to evaluate the implementation of a technology integration professional development program for teachers who were new to the Ocean County School District. This chapter provides discussion about this mixed-methods action research study using each of the three research questions. Implications for future iterations of this study, as well as for a next phase of it are considered. Limitations of this study are also identified in this section.

Discussion

It is important to situate this study's findings within the larger literature, particularly the literature associated with technology integration, teacher professional development, and teacher characteristics that impact readiness to integrate technology. This discussion is organized by the three research questions.

RQ1: How Does a Technology Integration Professional Development Program Impact Teachers' Perceptions of Readiness to Integrate Technology Within the Classroom?

As was mentioned in chapter two, Petko, Prasse, and Cantieni (2018) found that teachers' perceptions of readiness to integrate technology can be determined by several factors. These include the teachers' perceptions of their abilities to integrate technology, their years of teaching experience, and their exposure to technology in college and preservice teaching.

Perceptions of abilities to integrate. Inan and Lowther (2010) found that technology integration was directly affected by teachers' readiness. Readiness includes, "Teacher perception of their capabilities and skills required to integrate technology into their classroom instruction" (Inan & Lowther, 2010, p. 141). When teachers perceive they are more ready to integrate technology, then they will. Qualitative data, collected using the TTQ, show that most of the participants' readiness to integrate technology increase during the study. In terms of readiness to integrate, Anne, Doe, and Jane all showed growth from their pre- to postquestionnaire responses. Anne went from 3.50 to 4.00. Doe went from 4.00 to 4.75, and Jane grew from 3.75 to 5.00. While John did not show any increase in his readiness to integrate technology, he did stay the same, maintaining a pre- and postquestionnaire score of 4.00. After participating in the professional development sessions offered in the study, none of the participants felt less ready to integrate, and three of the participants felt more ready to integrate.

Qualitative data also corroborated the teacher participants' initial positive perceptions of readiness. This corroborates the findings shown in the prequestionnaire of the TTQ. When the study began, each participant answered in the positively when asked how ready they were to integrate technology. The participants were positive about their readiness to integrate technology at the beginning of the study. The degree to their readiness ranged from "I'm fine" (John) to "I could always do it better" (Anne) to "I feel ready, most of the time" (Jane) to "Pretty ready [in questioning voice]" (Doe). Each said that they felt ready, to an extent, to integrate technology at the beginning of the research.

This was also evident in their observations. For example, Google Classroom was an online tool the school's administration expected teachers to use with their classes

daily. Doe, Jane and John easily met this expectation, as they integrated Google Classroom into their daily lessons as a way to communicate with students, provide documents to the classes, and to collect assignments from students. These participants had an understanding of how the integration of Google Classroom could enhance their teaching from past school districts. They were comfortable with the program and its features. Anne, however, did not have this background and was not as comfortable integrating Google Classroom. Although she stated, "I like using Google Classroom," Anne had never had training on how to use the program or the opportunity to use it in her past teaching experiences. She said, "I've just learned through playing with it...just intuitively." Because of the expectation of its use, Anne focused on trying to learn Google Classroom when she started the school year. The effort put in to learning the program showed through Anne's frustration. She stated,

> Not that anyone taught me Google Classroom, or anything, but you know. It would have been nice…[laughter]. It would have saved me a lot of time fumbling around going, "What is…what is this thing that I have to do?" I think [her daughter] taught me more than anything. 'Cause she was using it at her other school. She's like, "You know mom, they can just download stuff to you."

Regardless of how she learned to use the program, Anne was successfully integrating Google Classroom when I began my observing her. This showed her growth as a technology integrator. She began the year not knowing how to use the program, and by the spring semester was using it in all of her classes. During the study's observations, the participants' readiness to use technology was evident. Even though Anne had not been

formally trained on Google Classroom, she was able to learn enough on her own to implement the program in her classroom. All of the participants showed their ability to integrate the program into their classrooms well. Each showed a readiness to use the program in their classroom without having a professional development session on it.

At the end of the study, the participants again had positive perceptions of their abilities to integrate technology. This perception of readiness was evident in the increases from the TTQ data as well as from the participants' interviews and observations. They recognized their growth and were ready at the end of the study to integrate technology more than they had been at the beginning. As Mueller et al. (2008) found, this growth in perception of readiness was due to the participants' increase in their usage of and positive experiences with the computer integration. These participants were encouraged to increase their computer integration and had successful outcomes when using the technology. This will lead to "more widespread computer integration" (Mueller et al., 2008, p. 1526). When asked how ready she felt to integrate technology, Anne replied in a more confident manner than she did during the first interview, now wanting to "take it to the next level." Similarly, Doe, in the second interview, maintained their earlier answer of feeling "pretty ready" to integrate technology, but mentioned, too, that they felt they had "tried a lot more new things this year." Jane, too, had an increase in her perception of readiness to integrate technology. When asked how ready she felt to integrate technology, Jane stated "I feel ready. Yeah." This concise, confident answer showed Jane's growth in her perception of readiness. While John's quantitative data did not change, the tone and his answer in the qualitative data gathered did. John went from "I'm fine" in the first interview to "I thought I already had. [Laughter.] I guess I'm

ready." John's perception of his abilities did not grow quantitatively, but it did increase qualitatively. While they had similar perceptions at the beginning of the study, they showed more confidence in their teaching and in their answers to interview questions about the topic at the study's end. This corroborates the assumption that readiness is indicative of ability (Petko, Prasse, & Cantieni, 2018). Because these participants perceived themselves to be ready to integrate technology, they improved their abilities throughout the study.

Preservice experience. The participants in this study identified themselves as average to above average in their readiness to integrate technology on the TTQ. This information, along with their interviews gave me pause to reflect on their initial estimations of readiness. When reviewing the qualitative data I collected, I noted that three of the participants mentioned integrating technology during their preservice teaching experience. The exposure Anne, Doe, and Jane had to technology integration during their preservice teaching experiences may have attributed to their estimations of readiness and may have given them an increased willingness to integrate technology in their own classrooms as professional teachers (Sadaf et al., 2016; Banas & York, 2014). Sun et al., (2017) found that teachers with exposure to technology integration in their preservice experiences will have better knowledge of technology and how it can be applied to student learning. The familiarity the three teacher-participants in this study had with technology integration may have been due, in part, to the opportunities they had in their preservice teaching experiences. As a veteran teacher, Anne had tried many software programs in her career, but continued to use one that she learned in her preservice teaching courses. "PowerPoint presentations" was required in Anne's

preservice courses. Likewise, Jane described her preservice teacher education as "using a lot of technology." She was more comfortable integrating technology than not because, as she stated, "it's how I learned to teach." Jane's past experiences and successes with specific technology tools gave her the confidence and readiness needed to integrate technology into her classroom. This was how she had "learned to teach." Since Doe had completed preservice teaching most recently, they had a different experience from the other participants. For example, Doe was introduced to Google Classroom and Google Drive during their student teaching. When describing how they learned to use Google Classroom, Doe said, "We really, like, were like strongly encouraged to use technology, and also, like, some of the teachers that I worked with like were already using it."

These qualitative findings support Cullen and Green's (2011) assertion that preservice teachers' comfort with technology improves attitudes and usage of technology in the classroom. The teacher-participants described their preservice technology integration experiences, and they expressed how these past experiences directly affected their integration now. Their continued use of these programs corroborates research findings that exposure to technology and the implementation of technology during preservice teaching experiences is beneficial to teacher readiness when using technology in their inservice classroom (Banas & York, 2014; Cullen & Greene, 2011)

Previous experiences and age. Inan and Lowther (2010) and Ertmer (1999) reported that previous experiences with technology — not age — were significant to affect teacher technology integration. However, one of my participants expressed that age did in fact impact readiness and how it related to professional development. Doe as described in Chapter 4 expressed that age played a role in technology integration and

willingness to use technology in the classroom. Age, to Doe, represented generational differences with regard to views on technology and abilities with technology integration. Doe stated, "I'm 29 years old, and I, the things that I need explained to me are not going to be the same as someone who's like, 59." Doe's perspective about their own abilities and readiness as recorded in the TTQ data showed the largest growth from pre- to postquestionnaire when asked about the technology's "Impact on Classroom Instruction. Doe's responses increased the mean score from 4.00: Agree to 5.00: Strongly Agree. This was the largest increase of any participant in this category. Doe's age and familiarity with technology helped to show them that the technology being used in the classroom was increasing student achievement.

This is different from Inan and Lowther (2010) findings and Ertmer's (1999) assertions. Age is not identified as a significant effect on (Inan & Lowther, 2010) or barrier to technology integration (Ertmer, 1999; Hew & Brush, 2007). While there is not a great deal of data from across the participants, Doe's emphasis makes this generational issue important to note. Others, including Tsai (2015), have discussed how veteran teachers may see benefits of technology integration, can see it as "an inconvenient teaching too" and may not use it (p. 157). Vongkulluksn et al. (2018), and Levin and Wadmany (2006) have reported that older teachers may be uninterested in integrating new technologies as they have been successful in the routines and pedagogical beliefs that they currently have.

Self-efficacy. Self-efficacy, determined by a person's "motivation, affect, and action" (Bandura, 1989, p. 1175), can be positively and directly linked to both intrinsic and extrinsic motivation (Cullen & Greene, 2011). The motivation a person has is linked

to their willingness to persist in reaching a specific level of efficacy. Bandura stated, "Efficacy expectations determine how much effort people will spend and how long they will persist in the face of obstacles and averse experiences" (Bandura, 1978, p. 141). Teachers, of any age, with a high self-efficacy towards technology integration may benefit from guidance without overt professional development involvement. Zhao et al., (2002) report that some teachers, who work better independently and rely less on the support of others can find greater success in technology integration (Hew & Brush, 2007; Zhao et al., 2002). In the beginning of this study, teachers did not show a high level of self-efficacy. This was shown by their admitted use of a few technology tools, largely PowerPoint, and the interactive white board. While the teachers were interested in learning more about technology integration, they did not have the self-efficacy, at this time, to research it or learn new programs on their own. Not all teachers develop a level of self-efficacy that would drive them to learn more on their own.

Some teachers with a high self-efficacy in teaching may tend to recognize that while proficient teachers, they will not excel at technology integration (Tsai, 2015). These teachers are more suited to continue teaching as they always have, and to be resistant to technology integration, believing that they will not be successful in this venture (Ertmer & Ottenbreit-Leftwich, 2010; Inan & Lowther, 2010). Mueller et al. (2008) stated, "A teacher with high teaching efficacy, therefore, may not necessarily hold an equally positive view of their ability to effect change using computer technology" (p. 1526). None of the participants in this study held this view of technology integration. All participants had a higher self-efficacy at the end of the study than at the beginning. Based on observations and postinterviews, the teacher-participants were confident by the

end of the study that they could successfully engage in technology integration. For example, Anne's future plans for technology integration included trying the Teaching for Artistic Behavior model and trying "to be able to flip the classroom." Doe, too, had planned to try new things in the classroom during the next school year, such as teaching students "how to research and how to look at different sources and compare them." John's confidence in his technology integration showed itself in "personally learning more" about technology integration. These teacher-participants were starting to look towards self-directed professional development as the study's professional development cycle ended. Mushayikwa and Lubben (2009) define self-directed professional development as "the professional development arising from the teachers' own initiative, i.e. the process is internally determined and initiated" (p. 376). The participants in the study began to identify their own needs and wants in regard to technology integration and what they would like to implement in their teaching. They were beginning to take the initiative, with their statements about future implementation, to begin learning more on their own.

RQ2: How Does Instructional Technology Focused Professional Development Remove Teachers' Barriers to Integrate Technology in The Classroom?

Chen (2008) stated that teachers need professional development that will "identify teachers' beliefs about effective teaching, strategies for improved teaching and learning, and curriculum design appropriate for pedagogical purposes" (p. 74). Chen is expressing the need teachers have for professional development that will work to eliminate second-order barriers from their classrooms. Second-order barriers include (a) teachers' confidence and belief in their own skills in using technology, (b) beliefs about students'

learning, and (c) beliefs about the value of technology in the teaching and learning process (Chen, 2008; Ertmer, 1999; Ertmer et al., 2012). During this study, professional development was used to help reduce second-order barriers for the four teacher-participants. Opportunities to remove second-order barriers were provided through the increase of skills during professional development sessions, the building of participants' self-efficacy, an increase in teacher-participants' perceptions of their readiness to integrate technology, and through an opportunity for the participants to provide feedback about their experiences with the professional development sessions and their experiences with technology integration using the qualitative data collection tools of interviews and reflection surveys. The findings for this research question are discussed within the framework on the three second-order barriers listed above.

Teachers' confidence and belief in their own skills using technology. One item in the TTQ (Lowther & Ross, 2000) applies to the second-order barriers regarding teachers' own skills in using technology. The item related to teachers' skills using technology in this subscale was "I Have Received Adequate Training to Incorporate Technology into my Instruction." In the prequestionnaire, the participants together rated this item at 3.25. In the postquestionnaire, that rating changed to 4.50. All but one participant increased their rating for this item. Anne's rating increased from 3.00 to 4.00, Doe's rating improved the greatest amount from 2.00 to 5.00, and Jane's went from 4.00 to 5.00. John's rating did not change from the pre- to the postquestionnaire, as it remained at 4.00. Doe's increase in rating is validated in their qualitative data, as well. Doe expressed some displeasure with the whole group professional development sessions, which was evident in her presurvey score. However, towards the end of the

study Doe expressed their preference for the one-on-one sessions and the coteaching. For example, when asked in our second interview about the impact of professional development on technology integration, Doe responded, "I think it has helped me a lot." Barbour et al. (2017) stated that teachers need "both in-service training and ongoing curriculum support" (p. 24) to successfully integrate technology meaningfully. Through the initial whole group professional development sessions and then the one-on-one and coteaching support, teacher-participants in this study showed growth in their abilities to incorporate technology into their lessons.

The more positive experiences teachers have using technology in the classroom, the more their confidence in using the technology will grow (Mueller et al., 2008). A way teachers' confidence in integrating technology can be increased is by helping them have positive personal experiences using technology successfully (Ertmer & Ottenbreit-Leftwich, 2010). Professional development is one way to provide this help, as it gives teachers a way to increase their comfort level and reduce fears (Ertmer et al. 2012). Teacher-participants showed an increase in their comfort level and confidence at the end of the study. For example, when asked if the professional development impacted her readiness to use technology, Anne answered "absolutely". She continued, saying, "You kinda just have to grab what —…the stuff that works out better for ya." Anne's confidence in her ability to integrate technology into the classroom during the study. During the observations of her lessons, she seemed more comfortable using the programs demonstrated during professional development, answering questions students had about these programs, and asking her own questions about integration and the next steps in the process, as mentioned previously.

Doe, too increased in their confidence in technology integration, but also grew their confidence in the support provided by the school and the school district. With personalized support from an educational technology coach and access to the school's on-site technician, Doe was able to get questions answered and technology fixed in a timely manner during the study. Inadequate technology support limited the motivation (Tsai, 2015). Doe had to integrate technology in the past. At Doe's last school, technology was not as accessible. Doe said, "Last year, like, I had, like, a projector and…the projector wouldn't work all the time". Doe continued saying, "It really limited me. Like, I got to where I was like, 'I'm not even gonna do this.' " At the completion of this research study, however, Doe's confidence in technology had changed. Doe said, "I know that if I try a new type of technology…and it's not working great, I can email you and find out, you know, what did I do wrong" As evidenced in the TTQ, Doe's initial view of technical training was low (Item score = 2.00). As the study progressed, Doe gained more confidence in the district's willingness to help with and to train on technology (Item score = 5.00). Jane's confidence, as stated previously increase during this study. She stated, "I'm comfortable," when asked about her readiness to integrate technology at the end of the study. John, too, stated, "I think I'm fairly comfortable," at the end of the study. The comfort level these participants felt gave them the confidence needed to integrate technology.

Teachers' beliefs about students' learning. Quantitatively, the TTQ was used to identify changes in teachers' readiness after the study had been concluded. In terms of the participant's perceptions of technology integration's impact on students, the TTQ showed that overall, there was an increase from the beginning of the study to the end. In

the prequestionnaire results, participants together rated the impact of technology integration on students to be 3.63/5.00. At the end of the study, the participants increased their scores to 4.13/5.00. Each of the items in this subscale increased by .50 from the beginning of the study to the end. Three of the participants showed an increase in their rating for this subscale from the prequestionnaire to the postquestionnaire. Jane increased the most, moving from 3.75 to 4.75. Doe went from 3.50 to 4.25, while John improved from 3.25 to 3.75. The only participant who did not increase their score was Anne who decreased from 4.00 to 3.75. While Anne did not ever directly mention the impact of technology on students, she did repeatedly mention in her interviews that the students were not using technology to "create art," which led her to state that students being able to create art "that, I think, would be a true integration." So, the teachers' increase in skills and confidence translated into higher beliefs about technology integration's ability to positively impact their students.

Two items in this TTQ subscale, "Impact on Students," related to student learning more than the others. The first item was "The integration of technology has positively impacted student learning and achievement." For the four participants, this item increased from 4.00 in the prequestionnaire to 4.50 in the postquestionnaire. Both Jane and John increased their ratings for this question, from 4.00 to 5.00 and 3.00 to 4.00 respectively. The second item, "The use of technology has improved the quality of student work," increased from 3.00 to 3.50. While Anne and John's scores for both the pre- and postquestionnaire remained 3.00, Doe and Jane both increased from 3.00 on the prequestionnaire to 4.00 on the postquestionnaire. Jane showed evidence of this growth in our second interview when describing the social justice projects her students

completed. The students used technology tools from the professional development sessions we had to create their research project presentations. She said, "I felt like that was a success."

Ertmer and Ottenbreit-Leftwich (2010) found that "technology is essential to successful performance outcomes" (p. 256). Qualitatively, the participants found that students' learning was impacted by the integration of technology. For example, Jane expressed that her students were "learning how to use computers… [at an] advanced rate." This comment on how well students are using and learning the technology substantiates the data collected from Jane in the TTQ. Anne also remarked on the positive increase in student learning when discussing the review game we integrated into her class stating, "The kids were in to it." Based on classroom observations and notes I recorded in my research journal, Anne's students were engaged and working hard to improve their scores in the games.

Beliefs about the value of technology in the teaching and learning process. The TTQ subscale "Impact on Classroom Instruction" focuses on the way technology impacts teaching. Ertmer and Ottenbreit-Leftwich (2010) stated, "Effective teaching requires effective technology use" (p. 526). Using the technology available effectively can impact teaching in positive ways. Overall, the participants improved their ranking for this subscale from pre- to postquestionnaire. In the beginning, the participants together ranked this as 4.06 out of 5.00, which was relatively high. After the study, that ranking increased to 4.38. One item in this subscale focused on technology in the teaching and learning process. This item stated "My teaching is more interactive when technology is integrated into the lessons," and the prequestionnaire rating of this item was

3.50 for the four participants. The postquestionnaire rating was 4.25. The teachers responded that they were better able to interact with students in their classrooms when using technology through this item. Neither Anne nor Jane's scores changed from pre- to postquestionnaire for this item, staying at 3.00 (Anne) and 5.00 (Jane). Doe did increase, however, from 3.00 to 5.00 and John from a 3.00 to a 4.00. This shows that none of the participants responded that they lost any of the community or interaction with students due to the addition of technology, and two participants indicated their teaching had become more interactive.

RQ 3: Based on The Data Collected During Implementation, How Do New District Teachers Respond to Technology Integration Support?

Inan and Lowther (2010) defined overall support for technology in a school as "Teachers' perception of support from administration, peers, students, parents, and community for laptops integration" (p. 939). In this study, three different types of support were included in overall support. These types were (a) administrative and school support (b) technology support with hardware, software, and filtering, and (c) professional development support.

Administrative and school support. Administrative support, and that of a supportive school community has an impact on the success or failure of technology integration (Grant et al., 2005; Inan & Lowther, 2010). Inan and Lowther, (2010) also described the importance of technical support on technology integration. They identified technical support as "teachers' perception on adequacy of technical support, availability of resources, and assistance with laptops" (p. 939). This type of support can be critical to the integration of technology and "can be limited when there is not an appropriate level

of integration with necessary school resources, particularly wireless internet access (i.e., Wi-Fi) and school administrative software" (Barbour et al., 2017, p. 27).

Support for technology integration data were collected both quantitatively and qualitatively. Quantitative data was gathered using the TTQ data collected. Based on the survey's results, the participants' determined that the support from the school was positive. In the TTQ, support was broken down in two subscales: "Overall Support for Technology" and "Technical Support. Teacher-participants all responded positively on the survey to questions about the school's overall support for technology. Combined, the participants' mean score from the prequestionnaire was 3.69 out of 5.00. After taking part in the study, the postquestionnaire results showed a mean score of 4.06. This increase was consistent with Inan and Lowther's (2010) interpretation of the importance of support. They state that overall support has been "considered to be a critical component of a successful laptop integration effort" (p. 938) Doe's mean score grew the most for this category during the study, starting at 2.50 and increasing to 3.50. Jane, too, showed some increase from 4.25 to 4.75. Anne and John both remained the same pre- and postquestionnaire with 4.00.

Technology support with hardware, software, and filtering. The second category of support measured by the TTQ was that of technical support. While not all participants increased their ranking, this subscale mean score grew from pre- to postquestionnaire. At the beginning of the study, the participants ranked the mean score as 3.88. At the end of the study, the score had risen to 4.31. Looking at this individually, Jane and John both increased their mean scores over the course of the study from 4.00 to 4.75, Anne increased from 3.50 to 4.00, while Doe decreased from 4.00 to 3.75. Doe's

decrease was an interesting point of data, as they were very complementary of the on-site technical support during their interviews, stating at one point, "I feel like the level of support here for technology is super helpful. Even just as far as, like, [the technician] being like super available. Like, I know that if I email him, he'll get back to me". The teacher-participants identified technology support in the school, including that by the administration, community, and staff, as well as by the on-site technician, to be positive.

Professional development. Inan and Lowther's (2010) category for support was evident during this study in the coaching, coteaching, and one-on-one instances of professional development. Inan and Lowther (2010) included the "amount of professional development and training opportunities provided in the school regarding laptop integration into classroom instruction" (p. 939) when defining professional development's role. A specific item on the TTQ "I have received adequate training to incorporate technology into my instruction" showed significant growth from the pre- to postquestionnaire. At the beginning of the study, participants rated this 3.25. At the end of the study, this rating had increased to 4.50. This was a surprising increase. Individually, John was the only participant whose score did not change. He remained at 4.00 on both the pre- and postquestionnaire. The rest of the participants, however, did increase their scores. Anne increased from 3.00 to 4.00, Jane increased from 4.00 to 5.00, and the largest increase for this item was Doe's change from 2.00 to 5.00. This shows that the participants felt the training was successful. No participants stated that they did not receive adequate training to integrate technology during this study.

While coaching, one-on-one sessions, and coteaching were facets of the professional development that participants received during this study, the school in which

the research took place did not specifically classify these sessions as professional development. The teacher-participants and administration identified only the whole group professional learning community meetings as professional development, as these were the sessions where certification credit renewal hours were given to participants. This study does include these sessions as professional development because I was able to tailor the learning to mee the teacher's individual technology needs (Ertmer & Ottenbreit-Leftwich, 2010).

Coaching. Showers and Joyce (1996) documented that teachers who took part in coaching "practiced new skills and strategies more frequently and applied them more appropriately" (p. 14). In this study, I worked closely with the teacher-participants to help them gain new skills and strategies to use in their classrooms. During our coaching cycles, I introduced new tools to the teacher-participants, met with them in one-on-one sessions, and cotaught lessons with them. The participants found the new strategies and skills they gained from the professional development sessions beneficial. For example, Doe stated that they "feel pretty ready" to integrate technology after being a part of the study "because I've had training, and, like, seen some new things myself, which is always really helpful." John, too, found himself more ready after the study remarking that, "I just had to get used to the…the new programs." Once the participants became familiar with the new programs they learned and how they could be used in the classroom, they were ready to apply them on their own. Anne remarked that the professional development sessions had "people trying things." She said they were successful for the staff because it "shows them options." With these options, participants and the rest of the staff were able to practice the programs we learned and apply them to their teaching.

Coteaching. Coteaching in this study was a powerful professional development tool. It provided teacher-participants who need to see how the new technology programs could be integrated into their classrooms and content areas in a dynamic way (Desimone & Pak, 2017; Ertmer & Ottenbreit-Leftwich, 2010; Hew & Brush, 2007; Veenman & Denessen, 2001). When asked what could help her to improve her technology integration, Jane remarked that "just what we've been doing this year, um, with you coming in" would help. The collaborative nature of coteaching, where teachers and coaches are able to "share responsibility for planning, delivering, and evaluating instruction for a group of students" (Friend & Reising, 1993, p. 6) allowed for the teachers to see a new program being used in the classroom, ask questions about its integration, and try teaching a lesson with another set of hands in the room to help. Doe commented that when we were coteaching, "just having an extra person who knows how it all works is super, super helpful. Especially, like, when I'm learning a program too." Altstaedter, Smith, and Fogarty (2016) found that successful coteaching requires teachers to work together in their planning, teaching, and assessment of lessons. During this study, this process was followed, and teacher-participants found them to be successful, or as Anne commented "they're great."

Professional learning communities. While research literature explains that professional learning communities and whole group professional development sessions are different. Battersby (2019) stated, "PLCs provide an infrastructure for teachers to promote collaborative learning to improve their own practice through constructive dialogue and shared practice resulting in improved student learning" (p. 16). Desimone and Pak (2017) discussed the effectiveness of collective participation during professional

development. Collective participation happened when "teachers from the same grade, subject, or school participate in PD [professional development] activities together to build an interactive learning community" (p. 5), which is also known as professional learning communities. Whole group professional development, however, allows for teachers of different grade levels and content areas to work together (Desimone & Pak, 2017).

Because of the way that professional development was implemented at this school, these types of professional development, professional learning communities and whole group, were synonymous. For this study, the term *whole group* was interchangeably used with *professional learning communities* to describe the professional development sessions. Teachers attended the professional development sessions monthly during their planning periods. These allowed for peers from common grade levels, special education, English as a Second or Other Language, and electives (art, music, choirs, technology, physical education, and international language) teachers to meet at common times and aligned with one part of DuFour's professional learning community model (DuFour & Eaker, 1998). Core subject area teachers, those who taught math, English, science and social studies, had two planning periods a day. Special education and English as a Second or Other Language teachers had one planning period at different times of the day. They would attend the sessions with the grade level that had planning at that time. Electives teachers were unique in that they did not have a planning period. They were given a longer time for lunch, during which they would attend the session. Anne did not like this configuration for professional development sessions stating, "We kinda rush through 'em, because…because you don't want to take up our lunch." These teachers had about 45 minutes allotted for lunch and professional development.

The professional development sessions included in this study were positively received by the participants. While Doe did state that differentiation during these sessions would be helpful, they also said "I think it [professional development sessions] can be super helpful." When asked about the impact the professional development sessions had, John replied, "I would say a positive impact. I use some of the stuff." Jane, too, stated, "it's [the professional development is] something I can use."

One-on-one sessions. Fenton (2017) stated, "Professional development efforts that fail tend to be those where the activities are irrelevant to teacher classroom practice or one-shot approaches with little follow-up" (p. 171). One-on-one sessions to review the professional development introduced in whole group sessions and to plan for coteaching was a valuable facet of this study. Doe stated, "I do feel like the times that you've been in here it was super helpful." While Jane said the one-on-one sessions and coteaching "helped." The one-on-one sessions were helpful because I was able to use teacher-participants' content and upcoming lessons to convey specific information and give examples of how the technology could be integrated into the learning and meet the teacher-participants' needs (Desimone & Pak, 2017).

Summary

The comfort and confidence teachers have with technology directly impacts their integration of technology in the classroom (Inan & Lowther, 2010; Ertmer et al., 2012). Teachers' willingness to integrate technology is impacted by teachers' pedagogical beliefs (e.g., their beliefs, attitudes, and views about technology integration, its impact on student learning; Ertmer, 2005) and their previous experiences with first-order barriers (e.g., hardware, software; Ertmer, 1999). In this study, professional development helped

teachers who were new to the district improve their confidence in integrating technology and increase their comfort levels with technology. Using differentiated methods of implementation, professional development can be tailored to fit the needs of teachers (e.g., Kopcha, 2012; Sugar, 2005) in their content areas using the devices available to them. Through professional development sessions, the support of administrators, and the help of school technology staff (Lowther, Inan, Strahl, & Ross, 2008), the teacher-participants in this study were able to overcome first-order barriers to increase their confidence in and comfort with technology integration. Participants in this study, overall, showed growth in their use of technology in the classroom, their readiness to integrate technology, and their response to support when using technology, and the participants' experiences in this research corroborate previous findings on types of teacher professional development (e.g., Lowther et al., 2008; Sugar, 2005), increases to teachers' technology skills and confidence (Inan & Lowther, 2010), and removal of barriers to technology integration (e.g., Ertmer et al., 2012; Kopcha, 2012; Lowther et al., 2008).

Implications

The purpose of this action research was to evaluate the implementation of technology integration support for teachers who were new to the school district. While there were some limitations, as described below, this evaluation showed positive findings. The results of this study show that consistent professional development sessions along with follow-up sessions including one-on-one meetings and coteaching provided positive and impactful options for teachers who are new to the school district. These findings were consistent with Mouza's (2002) findings that "traditional sit-and-get training sessions without follow-up support have not been effective in preparing teachers

to integrate classroom technologies" (p. 273) As technology continues to grow and expand within the school district. The teachers have received new interactive white boards and laptops over the course of the last two years, the teachers' need for support when integrating technology and for technology professional development has increased as well. Creatively structuring professional development sessions to meet the needs of teachers is an effective way to help teachers integrate technology. This can be accomplished by linking content presented in a whole group professional development session and in a teacher's classroom (Sugar, 2005).

Three types of implications have resulted from this study. Personal implications, implications for professional practice, and implications for future research. Each of these implications will be discussed further below.

Personal Implications

Mertler (2017) describes action research as "a process that improves education, in general, by incorporating change" (p. 17). I agree with his assessment of action research. While completing this study, I have changed as an educational technology coach and as a researcher. I was new to action research when I began working on this study. Throughout the different stages of the process, I have learned more about educational research, the action research process, and analyzing data results. Without knowing it, I had been using parts of the action research process in my teaching, especially when observing my students and their work, revising lessons to reteach a concept, or when I was reflecting on the parts of a unit that were and were not successful. As a teacher, I was always concerned with student learning and making sure the instruction I provided met the needs of my students. I used the information I gathered from informal individual

conversations with students, classroom discussion, and assessment results to influence the decisions I made. This is similar to the action research process in that action research relies on reflection and collaboration to improve educational practices (Mertler, 2017).

As a classroom teacher, I used informal interactions with students and formal and summative assessments to evaluate my students' knowledge and to evaluate the effectiveness of my teaching. As an educational technology coach, however, I do not have an instrument to measure how effective my professional development sessions have been. Most of the time, the informal conversations I had with teachers during and after the sessions was the only feedback I would receive about the professional development. This is something I will begin to change in the future. Assessing how the professional development was received, following up with teachers to see how they are integrating the technology we discussed in the session, and learning what I can do to improve the likelihood of teachers to integrate the technology shown at professional development sessions are all steps I can take in evaluating the effectiveness of the professional development I provide. These steps will make me a better educator and coach.

In the past, I planned professional development based on what administrators, teacher needs assessments, and the school district stated was important for teachers to learn. I did not plan professional development based on increasing educators' practice or improving student learning (e.g., Guskey, 2014). Also, I had never used research about the types of professional development (e.g., one-on-one meetings, coaching, coteaching, whole group professional development, and professional learning communities) and when to implement specific types when planning my professional development sessions (e.g., one-on-one sessions for integrating technology into content-specific lesson

planning; Desimone & Pak, 2017). In the past, designing professional development was not a scholarly practice for me. In the future, however, I will use research and current practices to plan my professional development sessions. After completing this study, I have learned more about the types of professional development and have seen how teacher-participants reacted to the different types of professional development I implemented. After analyzing the feedback about how the specific types of professional development impacted the participants, I better understand how important differentiation of professional development sessions can be. Through current literature about professional development practices and differentiating the professional development delivery, I will be able to improve and adjust the professional development sessions I conduct in the future (Fenton, 2017). Learning more about professional development and how it can impact student learning will make my professional development sessions better resources for teachers. Also, continuing to use methods incorporated in this study will help me to better meet the needs of teachers. For example, observing teachers' classrooms before and during technology integration and debrief with teachers after professional development are two ways I can make my myself a and my professional development more effective (Gallucci et al. 2010).

Implications for Professional Practice

The findings of this study will be helpful to many professionals within my school district. Teachers and school administrators, district educational technology coaches, and district administrators can all benefit from the findings in this study as it relates to types of professional development and technology integration. As mentioned in the plan for sharing and communicating findings, I will share my results with stakeholders at both the

school and district levels. The implications of this study on these stakeholders are described below.

Teachers and school administrators. The results of this study will be shared with the teacher-participants and administrators at the school where the research took place. This will be an important part of my plan for sharing, as the stakeholders at the school have a direct connection to the methods and findings that were a part of the study. Providing the teacher-participants with data focused on their interpretations of the professional development provided, their reactions and remarks on those sessions, and the data gathered from the professional development will give them a better understanding of how technology integration focused professional development impacted them and their teaching. As the study has concluded, these results may provide the teacher-participants with the ability to reflect on lessons, professional development sessions, and the impact the coaching provided had on their technology integration. Also, by reflecting on the types of professional development sessions they took part in, teacher-participants can actively seek out those types of professional development sessions when they are being trained on a topic. For example, those who were most impacted by one-on-one sessions can work with the professional development provider to schedule a time to work individually to learn or create lessons on the topic presented.

I will also share the findings of this study with school administrators. Included in this group are the principal, assistant principal, and literacy and numeracy coaches. Administrative support is an important factor in technology integration (Inan & Lowther, 2010). Providing the school's administration with information about how their positive expectations and support for technology integration helps teachers to overcome first-

order barriers will be influential (Ertmer, 1999). The TTQ (Lowther & Ross, 2000) data, specifically, will provide the administrators with valuable data that reinforces the impact that both their support for the use of technology and the positive school culture related to technology have an effect on teachers and their willingness to integrate technology.

The information found in this study will be important for administrators, too, because they also perform professional development for teachers at the school. Providing administrators with the results of this study will help them to learn more about the importance of professional development, the types of professional development, and information to consider when deciding on the type of professional development to use. As Guskey (2014) noted, the design and content of professional development are critically important to the success of the session. Given the data presented in this report, the school's administrators will be better able to present information to teachers in a way that engages them and makes them comfortable with the topic. For example, as mentioned previously, when teachers feel comfortable using technology, they are more likely to integrate technology (Cullen & Greene, 2011). If the school's administrators can use the information found in this study to design thoughtful professional development sessions that develop teachers capacities using a learning community that fosters collaboration, follow-up sessions, and a create a positive school culture, teachers will feel comfortable with the topics and more likely to implement the learning (Sugar, 2005).

District educational technology coaches. The findings of this study will be helpful to educational technology coaches in my school district when planning for professional development sessions in schools. As mentioned in the plan for sharing and communicating findings, I will share the information from this study with my peers

during an upcoming staff meeting. The different types of barriers teachers face, both first-order and second-order (Ertmer, 1999), will be information that my colleagues have not been privy to. Learning more about these barriers will give them a better understanding of the teachers they are working with and the approaches that can be taken to improve the professional development sessions provided at the schools. Also, learning more about professional development and the different types of sessions will be helpful. Currently, whole group professional learning community sessions are the most frequent type of professional development offered. Some coteaching is implemented, too, but to a lesser extent. Learning more about designing professional development, specifically about one-on-one, co-planning, modeling, and coteaching, will benefit the educational technology coaches and improve their capacity for differentiating professional development to meet the needs of teachers. Identifying the beliefs of teachers, the value associated with technology integration, and the impact they perceive technology integration has on student learning will make the educational technology coaches better able to help teachers use technology in the classroom to improve teaching and learning (Chen, 2008).

As part of sharing and communicating my findings, I will ensure that educational technology coaches will have the ability to review the literature included in the study, consider the interventions used, and adopt and use the data collection instruments when working with teachers themselves. Sugar (2005) stated, "The role of technology coach is to support and maintain teachers' confidence in learning and using new technologies" (p. 567). Using the information found in this research study, the educational technology

coaches will be able use different types of professional development to support the participants in their confidence in learning and using technology.

District administrators. I will share the information found in this report with the director of educational technology and the district's educational technology coordinator. District leaders coordinate the districts' technology development and planning for integration (Hoffman, 1996). More specifically, these administrators oversee the educational technology coaches, work with school administrators to devise the school-based trainings provided to teachers, and determine the focus of the educational technology department for the school year. Sharing the results of this study will be valuable to them because they will have more information about the types of professional development sessions that have been researched, used, and successful in teachers' classrooms. When planning out the next year's trainings, different types of professional development sessions can be included and prepared so as to create learner-centered professional development that includes the concerns and needs of participants (Yurtseven, O'Dwyer, & Lawson, 2020).

According to district data, a technology goal of Ocean School District is to increase student achievement by improving the competency of all district employees using research-based strategies and effective technology integration systems. Having current evidence of successful strategies implemented in the school district that worked to improve technology integration will help the district administrators when speaking with principals, district staff, and school board members about the importance of technology integration and the successes that can be found from implementing it in the classroom.

Implications for Future Research

As this was my first action research study, I have learned a lot about designing research, collecting data, and analyzing results. While I am pleased with the study I performed, there are aspects of this action research study I would like to include if I were starting a second cycle of this study. If I were to continue implementing this study at schools within the district, I would want to make changes to compare and contrast first cycles from one case to another.

Second cycle changes. Future cycles of action research could improve both the quality and quantity of findings reported. More data from participants, both teachers and students, would improve the depth of the findings. For example, gathering data from a larger sample about teachers' beliefs about technology integration, the impact of the professional development sessions, and the impact of technology integration on student learners would improve future studies.

Gather more data about teachers' beliefs. Additional qualitative data would also aid in the descriptive analysis I can provide when reporting my findings. While the TTQ provided information about teachers' beliefs about technology integration, I would like to include more qualitative data about the topic. As teachers' beliefs about technology integration have a significant direct effect on technology integration (Inan & Lowther, 2010), getting more detailed information through semi-structured interview questions and targeted questions on teacher observation reflections would be helpful in improving this study.

Measure the impact of professional development sessions. Based on the data gathered from teacher-participants, the professional development sessions were helpful to

them when integrating technology. I would like to gather more specific data about the impact each type of professional development had on their technology integration. As Fenton noted, "Not all strategies of professional development work equally well and success may depend on the goal or focus" (Fenton, 2017, p. 171). Technology professional development is not optional in the school district, but the type of sessions that are offered can be customized to meet the needs of the teachers (Fenton, 2017). Knowing which specific aspects of the professional development (e.g., co-planning content-specific lessons, modeling lessons, whole group professional development) impacted the different technology integration topics we implemented would help me to better do this in the future.

Measure the impact on student learners. An additional opportunity would be to measure the impact of teacher professional development and technology integration on student learners. Technology integration's purpose is "to support student-centered and student-directed curriculum" (Ertmer et al., 2012, p. 423). This study, as it is currently designed, did not focus on student learners. While the TTQ did gather some perceptual data with respect to students, the overall focus of that measurement tool was on teachers and their beliefs. A tool like the IPI/SAMR model observation tool (Swayne, 2017) would be one that could help me better understand and measure the effect technology integration has on student learners.

Continuing the study. Future iterations and studies could also include comparative data to my first implementation. Two changes and improvements could significantly impact future findings. One change would be to encompass different grade levels. A second alteration would be to add more participants. These changes would

provide me with more information about teachers' technology integration that I could use to improve my professional development sessions. Each is further described below.

Change in location. I would like to repeat the implementation at an elementary or high school. I would like to learn about any differences among grade levels and schools with regard to teachers' perceptions of technology integration, their beliefs and attitudes towards technology integration, and how they would react to the different types of professional development sessions. Mueller et al. (2008) noted differences in how teachers in different grade levels used computers in the classroom in their study. I would like to learn more about how teachers in the lower grades and the higher grades are using computers, incorporating the professional development the school district provides them, and how student learners react to this integration. I think that comparing and contrasting data from three different levels would helpful for finding commonalities and differences that can be used when planning whole district professional development, as well as, professional development for specific schools and clusters within the school district.

Change in number of participants. Increasing the number of participants who took part in this study would have an effect on the findings and significance. There are two ways in which I could envision increasing the number of participants. The first way would be to increase the sample size. Increasing the number of participants would allow me to generalize the findings to a larger group beyond the four participants I had during this study, as well as have more confidence in how the findings could be employed across different contexts. This will be discussed further in the limitations section.

The second way I could increase the number of participants would allow me to have a more experimental methodology for the study. This would include having

teachers who would act as a control group and not take part in the one-on-one and coteaching portions of the study. Lawless and Pellegrino (2007) suggested in their research that studying both participants who took part in the professional development and those who did not. I am interested in these ideas. I would like to be able to compare and contrast data gathered from these two groups to better understand what impact, if any, the personalized professional development has on participants.

Limitations

As with any research study, there are limitations associated with this study. An action research study is a way to identify problems in schools (Mertler, 2017). Through this study, I was able to identify problems associated with technology integration support for teachers who were new to the school district. There were, however, issues that could be improved with future research.

Typical of both qualitative research in general and action research specifically, small sample sizes prevent generalizability of the findings beyond the context for the research (Maxwell, 2007; Morgan, 2007). This is indicative of my study as well. Generalizability, however, is usually not the goal of qualitative research and action research. As with any small purposively-selected sample, the number of participants limits the use of research study. So, any similarities and utility of these findings beyond my context reside then with the reader. Due to the small sample size, the same four participants were given the pre- and postquestionnaires, which did not allow for comparisons outside of the small group.

Another limitation is the variety of instruments used to collect data. The TTQ has been validated, so the results from the quantitative data collection are not concerning.

However as Lawless and Pellegrino (2007) assert, "Using self-report measures is not going to yield the type of data required to make evidence-based decision regarding the adoption of professional development programs" (p. 601). In addition, the quality of the observations, however, may be limited, as I had never used this type of observation tool before. This is limitation can be linked to a lack of preobservations for baseline data prior to the beginning of the study.

Also, the reflections that participants completed after their observations were insightful, but they did not provide the depth of information I expected. Each participant completed the reflections for their observations, but the data provided was brief. The teachers were reflective about their teaching and the technology they integrated, but the details were not very descriptive. Because the self-reflections were sparse, the data collected from them were not sufficient enough to report as its own instrument. So, these data were not robust enough to contribute more to the analysis and findings.

A final limitation I found concerned the evidence to support teacher self-efficacy. Currently, the self-efficacy growth of the teacher-participants is only reported from qualitative data. In order to more completely document the growth, teacher self-efficacy could be measured. For example, Watson (2006) used the Personal Internet Teaching Efficacy Beliefs Scale in his study to measure teachers' computer self-efficacy. Similarly, Kwon et al. (2019) investigated teachers' self-efficacy toward mobile computing devices with a researcher-created instrument. A quantitative instrument like these would allow me to gather pre- and postquestionnaire data about participants' self-efficacy similar to how I did when using the TTQ. Along with a larger sample, data on teacher self-efficacy could be compared across groups or pre-post.

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APPENDIX A

UNIVERSITY OF SOUTH CAROLINA CONSENT TO BE A RESEARCH SUBJECT

The Impact of Professional Development on Technology Integration

KEY INFORMATION ABOUT THIS RESEARCH STUDY:
You are invited to volunteer for a research study conducted by Mary Rizzi (rizzi@email.sc.edu). I am a doctoral candidate in the Department of Education, at the University of South Carolina, under the direction of Dr. Michael M. Grant (michaelmgrant@sc.edu). The University of South Carolina, Department of Educational Studies is sponsoring this research study.

The purpose of this study is to impact of technology integration support for teachers who are new to the Ocean County School District. You are being asked to participate in this study because you are an experienced teacher who has not taught in the Ocean County School District before this year. This study is being done at Southeast Middle School and will involve approximately four volunteers. This study will begin in January of 2019 and will last approximately 17 weeks.

This form explains what you will be asked to do, if you decide to participate in this study. Please read it carefully and feel free to ask questions before you make a decision about participating.

PROCEDURES:
If you agree to participate in this study, you will do the following:

1. Complete a survey/questionnaire/interview about technology and technology integration.
2. Have your discussion/interview recorded in order to ensure the details that you provide are accurately captured.
3. Attend technology-focused professional development sessions.
4. Meet one-on-one with the researcher to clarify professional development meeting and co-plan lessons for technology integration.
5. Coteach technology integrated lessons with researcher.
6. Have your classes observed approximately four times throughout the study by the researcher.

7. Have observations video recorded to ensure the details are accurately captured.
8. Complete online reflections about the lessons that were observed.

DURATION:
Participation in the study involves approximately six visits over a period of 17 weeks. Each study visit will last about 30 to 60 minutes.

RISKS/DISCOMFORTS:
There are no anticipated risks or discomforts associated with this study.

BENEFITS:
Taking part in this study may benefit you personally. This research may help you become more familiar with technology and more open to using it in the classroom. It may also help researchers understand the impact of professional development on teachers' technology integration.

CONFIDENTIALITY OF RECORDS:
Unless required by law, information that is obtained in connection with this research study will remain confidential. Any information disclosed would be with your express written permission. Study information will be securely stored in locked files and on password-protected computers. Results of this research study may be published or presented at seminars; however, the report(s) or presentation(s) will not include your name or other identifying information about you.

VOLUNTARY PARTICIPATION:
Participation in this research study is voluntary. You are free not to participate, or to stop participating at any time, for any reason without negative consequences. In the event that you do withdraw from this study, the information you have already provided will be kept in a confidential manner. If you wish to withdraw from the study, please call or email the principal investigator listed on this form.

I have been given a chance to ask questions about this research study. These questions have been answered to my satisfaction. If I have any more questions about my participation in this study, or a study related injury, I am to contact Mary Rizzi at (843-473-9867) or email (rizzi@email.sc.edu).

Questions about your rights as a research subject are to be directed to, Lisa Johnson, Assistant Director, Office of Research Compliance, University of South Carolina, 1600 Hampton Street, Suite 414D, Columbia, SC 29208, phone: (803) 777-6670 or email: LisaJ@mailbox.sc.edu.

I agree to participate in this study. I have been given a copy of this form for my own records.

If you wish to participate, you should sign below.

Signature of Participant	Date
Signature of Qualified Person Obtaining Consent	Date

APPENDIX B

INTERVIEW PROTOCOL

Time of Interview: Date of Interview:

Place of Interview:

Interviewer:

Interviewee:

Thank you for agreeing to take part in this research study. The purpose of this action research will be to evaluate the impact of implementation of technology integration support for teachers who are new to the school district.

Thank you for agreeing to participate in this interview. This interview will last 30 to 60 minutes. There are no risks expected as a result of your participation. As a reminder, your participation in this research study is voluntary, and you are free to withdraw from the interview or the study at any time without fear of negative consequences.

Ethical practices dictate that interviewees agree to being interviewed and to their knowledge of how the data gathered will be used. This consent form serves as an understanding of the purpose of your involvement and agreement to the conditions of your participation. Please read the following information and sign and date the form stating that you agree with the following:

- Audio of this interview will be recorded and a transcription will be produced.
- You will be sent the transcript and given the opportunity to correct any factual errors.
- The transcript of the interview will be analyzed by Mary Rizzi as the lead researcher.
- Access to the interview transcript will be limited to Mary Rizzi and university academic advisors with whom she might collaborate as part of the research process.

- Any summary interview content, or direct quotations from the interview, that are made available through academic publication or other academic outlets will be anonymized with a pseudonym so that you cannot be directly identified, and care will be taken to ensure that other information in the interview that could identify you is not revealed.
- The actual recording will be stored on a password-protected computer for the duration of the research and permanently deleted upon the conclusion of the research project.
- Any variations of the above conditions will only occur with your further explicit approval.

All or part of the content of your interview may be used:

- In academic papers
- In an archive of the project

By signing this form, I agree that:

- I am voluntarily taking part in this project. I understand that I don't have to take part, and that I can stop the interview at any time
- The transcribed interview or extracts from it may be used as described above
- I have read all of the information above
- I understand I will not receive any benefit of payment for my participation
- I will receive a copy of the transcript of my interview and may make edits I feel necessary to ensure factual accuracy and the effectiveness of any agreement made about confidentiality
- I have been able to ask any questions I might have, and I understand that I am free to contact the researcher with any questions I may have in the future.

Printed Name: _____

Participant's Signature: _____ Date: _____

Researcher's Signature: _____ Date: _____

APPENDIX C

INTERVIEW QUESTIONS

Introduction

1. What is a positive and a negative aspect to technology in the classroom?

2. How comfortable do you feel when using technology in your classroom?

General Information

3. How often do you use technology in your classroom?

4. What are your top 2 or 3 technology tools or pieces that you like to use and how did you become familiar with them?

5. What are your thoughts or feelings about technology integration?

6. What prevents you from using technology in your classroom more than you do currently?

Professional Development

7. What could be done to help you improve your integration of technology into the classroom?

8. What are your thoughts or feelings towards technology-based or technology-focused professional development?

9. What impact, if any, do you think professional development has on technology integration?

10. How has technology professional development impacted your feeling of readiness to use technology in the classroom?

Technology Integration

11. Can you tell me about a time when you were successful in implementing technology in your classroom?

12. Can you tell me about a time when you were not successful in implementing technology in your classroom?

13. How ready do you feel to integrate technology successfully into your classroom? Do you have any additional information you'd like to share? If not, thank you for your time today. You will receive a transcript of your interview for review before the conclusion of this study to ensure accuracy.

If you have any questions or concerns, please reach out using the provided contact information. Thank you again for participating in this interview.

APPENDIX D

OBSERVATION PROTOCOL

Looking for Technology Integration (LoFTI)

Purpose: LoFTI is a tool to aid in the observation of technology integration into teaching and learning. The data gathered through the use of the instrument should be helpful in building-level staff members as they plan and/or provide professional development in instructional technology (The William & Ida Friday Institute for Educational Innovation, 2010).

1. Please enter the date and time:

Date (mm/dd/yyyy):_____

Time (hh:mm):_____

2. Observer Name:_____

3. Which school is being observed? _____

4. Teacher Name:_____

For all items, check any and all which apply to the activities being observed.

5. Grade Level:_____

6. What track is this class:_____

7. Is technology in use?

☐ Yes ☐ No

8. How many students are…

In class_____? Using technology?_____

Comments:_____

_____

_____

9. Student Arrangement:

- ☐ Tablets, centers, pods
- ☐ Circle or U
- ☐ Cubicles
- ☐ Rows
- ☐ Other (please specify):_____

10. Learning Environment:

- ☐ Auditorium
- ☐ Cafeteria
- ☐ Classroom
- ☐ Gymnasium
- ☐ Media Center
- ☐ Multi-Purpose Room
- ☐ Outside
- ☐ Virtual Environment
- ☐ Lab
- ☐ Other (please specify):_____

11. Student Grouping:

- ☐ Independent Work
- ☐ Learning Center
- ☐ Pairs
- ☐ Small Groups
- ☐ Whole Groups
- ☐ Workshops
- ☐ Other (please specify): _____

12. Instructional Collaborators:

- ☐ Administrator
- ☐ Assistant
- ☐ Curriculum Specialist
- ☐ Media Coordinator
- ☐ Other Teacher
- ☐ Outside Consultant
- ☐ Special Education Teacher
- ☐ Student

- ☐ Technology Facilitator/Coach
- ☐ Volunteer
- ☐ None
- ☐ Other (please specify):_____

13. Core Subject:

- ☐ Arts
- ☐ Career/Technical
- ☐ Computer/Technology Skills
- ☐ English/Language Arts
- ☐ English as a Second Language
- ☐ Guidance
- ☐ Health
- ☐ Physical Education
- ☐ Library/Media Skills
- ☐ Mathematics
- ☐ Foreign Languages
- ☐ Science
- ☐ Social Studies
- ☐ Other (please specify):_____

Technology includes such things as computers, laptops, software, iPods, iPads, interactive whiteboards, panels, digital cameras, document cameras, video cameras, the Internet, clickers, 3D virtual space, etc.

14. Technology is being used as a tool for…

(check either teacher or student or both)

	Teacher	Students
Problem Solving (e.g. graphing, decision support, design)	☐	☐
Communication (e.g., document preparation, email, presentation, web development)	☐	☐
Information Processing (e.g., data manipulation, writing, data tables)	☐	☐
Research (e.g., collecting information or data)	☐	☐
Personal Development (e.g., e-learning, time management, calendar)	☐	☐
Group Productivity/Cooperative Learning (e.g., collaboration, planning, document sharing)	☐	☐
Formative Assessment	☐	☐
Summative Assessment	☐	☐
Brainstorming	☐	☐
Computer-assisted instruction	☐	☐
Face to face classroom discussion	☐	☐
Face to face group discussion	☐	☐
Asynchronous discussion	☐	☐
Drill and practice	☐	☐
Generating and testing hypotheses	☐	☐
Identifying similarities and differences	☐	☐
Project-based activities	☐	☐

Recitation	☐	☐
Summarizing and note-taking	☐	☐

15. Technology hardware is in use by…

(Check either Teacher or Student or both)

	Teacher	Students
Assistive Technology	☐	☐
Audio (e.g., speakers, microphone)	☐	☐
Art/Music (e.g., drawing tablet, musical keyboard)	☐	☐
Imaging (e.g., camcorder, film, or digital camera, document camera, scanner)	☐	☐
Display (e.g., digital projector, digital white board, panel, television, TV-link, printer)	☐	☐
Media Storage/Retrieval (e.g., print material, DVD, VCR, external storage devices)	☐	☐
Math/Science/Technical (e.g., GPS, probeware, calculator, video microscope)	☐	☐
Desktop computer	☐	☐
Other (please specify):_____	☐	☐

16. Technology software is in use by…

(Check either Teacher or Student, or both)

	Teacher	Students
Problem Solving (e.g. graphing, decision support, design)	☐	☐
Administrative (e.g., grading, record-keeping)	☐	☐
Assessment/Testing	☐	☐

Assistive (e.g., screen reader)	☐	☐
Computer-Assisted Instruction/Integrated Learning System	☐	☐
Thinking tools (e.g. visual organizer, simulation, modeling, problem-solving)	☐	☐
Hardware-Embedded (e.g. digital white board, panel, GPS/GIS, digital interactive response system)	☐	☐
Multimedia (e.g., digital video editing)	☐	☐
Productivity Software (e.g., database, presentation, spreadsheet, word processing)	☐	☐
Programming or web scripting (e.g., Javascript, PHP, Visual Basic)	☐	☐
Graphics/Publishing (e.g., page layout, drawing/painting, CAD, photo editing, web publishing)	☐	☐
Subject-specific software	☐	☐
Web Browser (e.g., MS Internet Explorer, Netscape, Firefox)	☐	☐
Web Applications	☐	☐
Course management software (DyKnow, etc.)	☐	☐
Database systems	☐	☐
Discussion boards	☐	☐
Libraries, E-publications	☐	☐
Search engine	☐	☐
Video, voice, or real-time text conference	☐	☐
Web lobs, blogs	☐	☐
Web mail	☐	☐
Wiki	☐	☐
Other (please specify):_____	☐	☐

For the following items, please indicate the percentage of students in the classroom showing positive student engagement.

17. Student Engagement is shown by…

Positive indicator of Engagement	*Circle your best estimate of the percentage of students showing each positive indicator of engagement*						*The opposite is Disaffection*
Sustained behavioral involvement	100%	80%	60%	40%	20%	0%	Tendency to give up easily in the face of challenges
Positive emotional tone—cheerful, calm, communicative	100%	80%	60%	40%	20%	0%	Negative emotional tone—boredom, depression, anxiety, anger, withdrawal, or rebellion
Selection of tasks at the border of their competencies	100%	80%	60%	40%	20%	0%	Selection of tasks well within their comfort zone
Initiation of action when given the opportunity	100%	80%	60%	40%	20%	0%	Passivity, lack of initiative
Exertion of effort and concentration	100%	80%	60%	40%	20%	0%	Laziness, distraction

****OPTIONAL ADDITIONAL ITEMS****

18. How was technology used in this classroom? (RAT framework; Hughes et al., 2006 Adapted from Wilder Research's Technology Integration Observation Protocol, Maxfield, Huynh, & Mueller, 2011)

(CHECK ALL THAT APPLY and type a brief description in the corresponding text box)

☐ **Replacement.** "Technology used to replace and in no way change established instructional practices, student learning processes, or content goals. The technology serves merely as a different means to the same instructional end. Most of the learning activities might be done as well or better without technology." (*Example:* Using an interactive whiteboard for the same purpose as a chalkboard)

☐ **Amplification.** "Technology used to amplify current instructional practices, student learning, or content goals, oftentimes resulting in increased efficiency and productivity. The focus is effectiveness or streamlining, not fundamental change." (*Example:* Using a word processor rather than written materials for instructional preparation)

☐ **Transformation.** "Technology used to transform the instructional method, the students' learning processes, and/or the actual subject matter. Technology is not merely a tool, but rather an instrument of mentality. The focus is fundamental change, redefining the possibilities of education. Most technology uses represent learning activities that could not otherwise be easily done." (*Example:* Using Google drive or any cloud based applications for student collaboration on a project.)

19. Classroom Agenda:

20. Other comments regarding teacher (e.g. demeanor, comfort with technology, interactions with students):

21. Other comments regarding students (e.g. comfort with technology, peer interactions):

22. Other comments regarding learning environments:

APPENDIX E

OBSERVATION REFLECTION FORM

Name:

1. Date of observation
2. Which technology tool/software was featured in your lesson?
3. Explain what went well in this lesson?
4. Explain what could have gone better in this lesson?
5. What impact, if any, did the technology have on the lesson's success or failure?
6. What did you learn from today's lesson that can help in future lessons?

Link to the form:

https://goo.gl/forms/vnAnuztCzBhPkhcM2

APPENDIX F

PRE- AND POSTQUESTIONNAIRE

Teacher Technology Questionnaire

First Name: _____

Last Name: _____

Age?_____

Gender? ☐ Male ☐ Female

Ethnicity? _____
For example, African-American, Asian/Pacific Islander, Caucasian, Hispanic, etc.

How many different students did you teach each week in Spring 2016? _____

What is your average class size? _____

Directions: Select the response that most accurately describes your level of agreement with the following statements.

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1. Most of our school computers are kept in good working condition.	☐	☐	☐	☐	☐
2. I can readily obtain answers to technology-related questions.	☐	☐	☐	☐	☐
3. The use of computers has increased the level of student interaction and/or collaboration.	☐	☐	☐	☐	☐

4. Parents and community members support our school's emphasis on technology.	☐	☐	☐	☐	☐
5. I know how to meaningfully integrate technology into lessons.	☐	☐	☐	☐	☐
6. My students have adequate access to up-to-date technology resources.	☐	☐	☐	☐	☐
7. Materials (e.g., software, printer supplies) for classroom use of computers are readily accessible.	☐	☐	☐	☐	☐
8. The integration of technology has positively impacted student learning and achievement.	☐	☐	☐	☐	☐
9. I am able to align technology use with my district's standards-based curriculum.	☐	☐	☐	☐	☐
10. Most of my students can capably use computers at an age-appropriate level.	☐	☐	☐	☐	☐
11. I have received adequate training to incorporate technology into my instruction.	☐	☐	☐	☐	☐
12. My computer skills are adequate to conduct classes that have students using technology.	☐	☐	☐	☐	☐
13. Teachers receive adequate administrative support to integrate technology into classroom practices.	☐	☐	☐	☐	☐

14. My teaching is more student-centered when technology is integrated into the lesson.	☐	☐	☐	☐	☐
15. Our school has a well-developed technology plan that guides all technology integration efforts.	☐	☐	☐	☐	☐
16. I routinely integrate the use of technology into my instruction.	☐	☐	☐	☐	☐
17. Teachers in this school are generally supportive of technology integration efforts.	☐	☐	☐	☐	☐
18. Technology integration efforts have changed classroom learning activities in a very positive way.	☐	☐	☐	☐	☐
19. The use of technology has improved the quality of student work.	☐	☐	☐	☐	☐
20. My teaching is more interactive when technology is integrated into the lessons.	☐	☐	☐	☐	☐

21. Please rate your level of computer ability.

☐ Very good ☐ Good ☐ Moderate ☐ Poor ☐ No ability

22. Do you own a home computer? ☐ Yes ☐ No

23. How many computers (laptop or desktop) are available for student use in your classroom? _____

24. How many mobile computing devices (e.g., tablets, Chromebooks, iPads, iPod Touches) are available for student use in your classroom? _____

25. Do you have a wireless cellphone or smartphone? ☐ Yes ☐ No

26. Can your wireless device access data services, such as browsing the Internet?

☐ Yes ☐ No ☐ Not Applicable

Do you own one or more mobile devices (e.g., tablet, iPad, Nook, Kindle, Galaxy tablet) other than a cellphone or smartphone?

☐ Yes ☐ No ☐ Not Applicable

27. How many mobile devices other than a cellphone or smartphone do you own (if applicable)? _____