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Andrea E.C. Tennant  
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Concordia University–Portland

College of Education

Doctorate of Education Program

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Using Teachers' Experience With Technology to Understand Their  
Learning and Teaching Styles

Andrea Elizabeth Cleary Tennant  
Concordia University–Portland  
College of Education

Dissertation submitted to the Faculty of the College of Education  
in partial fulfillment of the requirements for the degree of  
Doctor of Education in  
Higher Education

Heather Miller, Ph.D., Faculty Chair Dissertation Committee

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Concordia University–Portland

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## **Abstract**

Teachers are expected to integrate technology into classrooms to prepare students to acquire 21st century skills and prepare them for future workforce. The U.S. government has spent significant resources on technology to support student learning and improve academic outcomes. Teachers will need support to be able to implement technology with fidelity in their pedagogy. The purpose of this qualitative research study was to gain an understanding of how teachers integrate technology in their pedagogy. One research question guided this research case study: How do teachers' experiences with technology provide an understanding regarding their learning and teaching styles? The participants were made up of nine teachers from a middle school in North Carolina. Participants taught mathematics, English language, science, or social studies. Data was collected via from face-to-face interviews, observations, and member checking. To analyze the data, the inductive analysis model was used. The findings indicated that experienced teachers with high technology competency embraced it because of their willingness to improve their instructional practice. Teachers with the least experience with technology did not readily embrace it and integrated it inconsistently in their instructional practice. They relied on their prior learning and teaching style for the transmission of knowledge for their instructional practice. These teachers expressed the desire for ongoing professional development in their content areas to build their confidence and experience with technology. However, all the teachers agreed that technology is a useful resource that increased student engagement in the classroom.

*Keywords:* technology, pedagogy, instructional practice

## **Dedication**

To a vibrant dedicated educator: my mother Barbara. You raised me to embrace education as a powerful tool to reach all learners, and your prayers, love, and encouragement have sustained me throughout the successful completion of this program.

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I would like to acknowledge Dr. Heather Miller for her patience and guidance throughout this process. Her support has been immeasurable and has helped me complete my dissertation. To my dissertation committee members Dr. Aaron Deris and Dr. Edward Kim thanks for your time and providing constructive suggestions for my dissertation. To my editor Brittany Kallman Arneson thanks for editing my work.

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## **Chapter 1: Introduction**

Over the past quarter-century, technology use in classrooms has increased, causing important, positive changes in educational environments (Indrasiene, Dromantiene, & Bielskyte-Simanaviciene, 2015). For instance, innovative technological elements can create a more engaging classroom, with the potential to enhance learning and improve academic success (Indrasiene et al., 2015). Although the use of technology may not be a panacea for improving classroom pedagogy, it can help teachers enhance the content being taught. However, some teachers contend that technology integration into the classroom does not always align with their pedagogical way of thinking and teaching (Burke, Schuck, Aubusson, Kearney & Frischknecht, 2018). This way of thinking and resistance to technology was influenced by these teachers' self-efficacy, their experience, proficiency with technology, lack of professional development and the pressure of their school's administration (Burke et al., 2018). Some technology-resistant teachers question whether technology integration in the classroom can improve student learning outcome or improve their teaching practice (Burke et al., 2018). Still many teachers complain that time constraints hinder them from integrating technology in their instructional practices (O'Neal, Gibson, & Cotton, 2017).

These are reasons teachers give for avoiding or resisting classroom technology integration. However, Ruggiero and Mong (2015) argued that a significant reason teachers' resist integrating technology in their classrooms is because the use of technology does not match their learning or teaching style. Therefore, understanding teachers' experiences with technology and their learning and teaching styles can provide valuable insight into how teachers can better integrate technology into the classroom.

Teachers' belief about the inclusion of technology in learning environments have been established by prior research studies (O'Neal et al., 2017). Although access to hardware, software, and technology support has become less of an obstacle because of general increase in funds for technology support, educational training research still shows that teachers avoid integrating technology because technology-related pedagogy does not match their teaching style (Ruggiero & Mong, 2015). Little research has been conducted on the relationship between teachers' experiences with technology, their learning and teaching styles, and their methods of implementing technology in their classrooms.

Although understanding the teachers' experience with technology is important, it is evident that teachers' role changes as they shift their classroom to a technological environment. Teachers in a technological classroom are coordinators, mentors, translators, learners and experts (Shaffer, Nash, & Ruis, 2015). In a classroom where the teachers are viewed as the coordinator students would be seen engaged in various technology activities as they develop fundamental 21st century skills (Shaffer et al., 2015). Teachers will facilitate these activities as they link students with the variety of instructional technology tools (Shaffer et al., 2015).

As mentors, teachers will create individualized learning objective for students. This would entail teachers understanding their students' homes and communities so that they could improve their students learning outcome (Shaffer et al., 2015). Another role teachers' have in a technological classroom is as a translator. As students become more engaged in their technological environment students will need regular feedback as they navigate their way through their learning goals (Shaffer et al., 2015). By providing regular feedback to students it will help them progress with their learning and personal growth (Shaffer et al., 2015).



Teachers' as learners in the classroom is very important to their students' success. This is important because teachers must be knowledgeable and display comfort with the technology in their classrooms because technology can be used as a method to measure students' performance (Shaffer et al., 2015). As a learner it is the teacher's responsibility to be knowledgeable about advancement in technology as they link their pedagogy and technology together (Shaffer et al., 2015). In addition, as an expert in the classroom the teacher's knowledge is significant because they will use it to support technology integration in the classroom. This allows students to have access to both human and technology experts to help them as they navigate their way through their technology rich classroom (Shaffer et al., 2015). This study will support and add to research by exploring the relationship between teachers' experiences with technology and their teaching and learning styles.

### **Background, Context, History, and Conceptual Framework for the Problem**

With an educational paradigm shift towards the inclusion of technology in classroom instructions and the utilization of various form of learning strategies for student success, the use of technology may assist in ensuring an actual systematic teaching and learning process (Indrasiene et al., 2015). Whether or not technology is included in a teacher's pedagogy may be a result of the teacher's experience with technology. Research has indicated that the use of technology in a classroom can improve classroom instruction if the teacher has gained the knowledge and experience to teach using technology (Urbina & Polly, 2017). Understanding teachers' experience with technology through this study provided an understanding of how teachers' learning, and teaching styles impact the implementation of technology in the classroom.

The framework that guided this qualitative study is constructivism. Constructivism allows participants to construct their understanding through their own experiences rather than being told how to construct their understanding (Stake, 1995). Within the constructivist framework, theories are not used to generate experiences or knowledge; instead, participants can develop a theory through their inquiries or pattern of meaning (Creswell, 2012). Within the constructivist classroom learning environments students can construct knowledge by being active participants in the learning process as oppose to only acquiring knowledge passed on from the teacher (Korucu & Cakir, 2018). As students become more engaged in their learning process, they improve their opportunity of a positive academic achievement (Korucu & Cakir, 2018).

Student learning and knowledge is constructed through their learning environment where they can form their own understanding by sharing information, and experiences with their classmates and teachers (Korucu & Cakir, 2018). As student knowledge begins to grow through these interactions, it is important that teachers include technology in their classroom instructions so that students can gain 21st century skills to support their learning (Korucu & Cakir, 2018). Technology learning classrooms support interactions among students, and teachers to work together, jointly to construct knowledge, and engage students while they develop their learning style (Korucu & Cakir, 2018). This type of constructivism with learners supports the use of technology in the classroom.

The goal of this research study was not to discover but to construct an understanding of teachers' experiences with technology. The constructed knowledge that was gained was produced collectively, allowing for complex or simple interpretations, generalizations, and rich thick descriptions (Stake, 1995). Understanding a teacher's experience with technology helped

provide an understanding of how they learned and taught in the classroom. The use of technology in a teacher's pedagogy may help to teach students lifelong skills.

### **Statement of the Problem**

The rapid advancement of technology and its pervasiveness and influence on society has impacted the educational system. The unfolding issue for schools is how to effectively integrate technology in a teacher's pedagogy and content knowledge (Chuang, Weng, & Huang, 2015). Most researchers have evaluated the impact of technology on student learning, but the research gap lies in the unexplored link between understanding teachers' experience with technology and their learning and teaching style and the impact these styles have on technology integration in the classroom.

The Department of Education has spent billions of dollars in K–12 schools because they believe that technology must be integrated in schools (Kormos, 2018). They noted that technology inundates every area of our existence, so it is necessary for educators to take advantage of that and provide practical learning opportunities for students (Kormos, 2018). Away from school, learners are inundated with various modes of technology which allows them to come to school prepared to use technology to enhance their learning and world view (Carver, 2016). However, at school, their knowledge about technology may not be used to develop effective learning strategies because teachers may not have acquired the same level of comfort and familiarity with technology which could be as a result of their lack of experience with technology. Additionally, school districts have not seen its widespread implementation and use in the classroom or in a teacher's pedagogy because teachers may wrestle with how to successfully include it in their daily instructions (Carver, 2016). Furthermore, if a teacher lacks

technology proficiency or the experience with it, it becomes more difficult to integrate it in their instructional practice.

### **Purpose of the Study**

The purpose of this qualitative research study was to gain an understanding of the relationship between nine teachers' experiences with technology, their learning and teaching styles, and their sense of self-efficacy in the classroom. To conduct this investigation, teachers at one middle school were recruited from a variety of academic disciplines. I used a single case study to gather information in order to gain an understanding about teachers' experience with technology based on the recommendation of Stake (1995). The data was collected using interview open ended questions to gather information which allowed the teacher participants to share their experiences, classroom observations and member checking. Using interview open-ended questions to gather data from multiple viewpoints about teachers' technology experience was a practical way to gather information when using a case study design methodology. After collecting the data, I analyzed the data generated through the interviews using inductive information processing based on the recommendations of Hatch (2002). This approach provided a framework which guided me through the steps of conducting an inductive analysis.

### **Research Question**

This study sought to gain an understanding of the following research question about teachers' experience with technology in a school setting in a middle school in North Carolina: How do teachers' experiences with technology provide an understanding regarding their learning and teaching styles?

## **Rationale, Relevance, and Significance of the Study**

### **Rationale**

The study filled a gap in the research on teachers' reasons for incorporating or avoiding incorporating technology into their classrooms. Few studies have explored whether teachers' experiences with technology affects their learning and teaching styles (Liu, 2011). Exploring inconsistent technology use by teachers can provide insight into teachers' experiences for teaching with or without technology (Liu, 2011). This insight may lead to more effective support from schools or the school districts and professional development for teachers in the area of technology integration, or professional development in specific content area as well as paving the way for further research in this area.

### **Relevance**

Technology is more prevalent in school now than ever before, and yet little research is being conducted on how schools can assist teachers' who may not be technologically savvy. With the additional possibilities for students to enhance their learning style and to learn in a student-centered environment, teachers' experience with technology would be helpful in integrating technology in their pedagogy (Gilakjani, Leong & Ismail, 2013). With the potential for learners that technology provides, teachers' lack of experience leads them to not use it or they use it as an alternative for other apparatus used in traditional teaching methods (Gilakjani et al., 2013). The integration of technology in the classroom is fundamental to improving the educational system (Cervenaska, 2013). Twenty-century students' lives outside of school are saturated with technology; therefore, using technology in teaching has the potential to engage students and help them access the content in new effective ways. Secondly, technology may

improve the quality of teaching by providing practical solutions to everyday challenges (Cervenanska, 2013). Technology can help students build knowledge and competence; therefore, it is essential that technology be incorporated into all levels of education, including primary, secondary, post-secondary and professional education (Cervenanska, 2013).

This study about technology is relevant because teachers are responsible for their students' acquisition of knowledge (Tondeur, Braak, Ertmer, & Ottenbreit-Leftwich, 2017). Teachers are viewed as the facilitators of student learning therefore understanding their experience with technology and how it links to their learning style and teaching style is important. This is a relevant topic because teachers' pedagogical beliefs may be linked to them interacting with technology to gain technology proficiency and experience. Teachers hold beliefs about various aspects of student learning, their role as a teacher, the content area that they teach, their experiences and how it impacts learning and their responsibilities as a teacher (Tondeur et al., 2017). Therefore, this study is relevant because pedagogical beliefs of teachers act as a buffer for implications and relevance (Tondeur et al., 2017). This buffer is used when understanding teachers' experiences in technology and classroom integration of technology (Tondeur et al., 2017).

### **Significance**

The current study was significant because of its potential to add to the body of scholarly knowledge about teachers' experiences with technology and its relationship to their learning and teaching styles. The study was also significant because the Department of Education in the U.S. have invested billions of dollars into technology integration for schools. The results of this study have the potential to help researchers and educators understand why some teachers have adapted

to using technology in their instructional practice and others may have not. The study results may provide insights on how teachers can effectively incorporate technology into their classrooms and allow more students to receive the benefits of technology-enhanced curricula. This research study will inform and provide pertinent information from data interpretation for the research study.

### **Definition of Terms**

The following terms are defined as follows throughout the study:

*Constructivism*: A theory stating that knowledge is constructed and not discovered (Stake, 1992).

*Educational technology*: The study and method of learning and improving academic outcome by creating and using technological resources (Kormos, 2018).

*Instructional practice*: The individual methods teachers use to teach in their classrooms' (Liu, 2011).

*Learning style*: The way individuals learn and recall information for them to comprehend and complete a task (Jepsen, Varhegyi & Teo, 2015).

*Pedagogy*: Teachers' beliefs about and methods of delivering instruction in the classroom (Chittleborough, 2014).

*Professional development*: Meetings used to assist teachers to learn about student performance standard, new methods of teaching in content area sharing new teaching strategies for diverse student population (Trust & Horrocks, 2017)

*Self-efficacy*: Personal beliefs about one's competence to acquire skills or perform task at an appropriate level (Hsu, 2016).

*K–12 schools:* Schools that include elementary, middle school, and high school (Liu, Ritzhaupt, Dawson, & Barron, 2017).

*Teaching beliefs:* Internal constructs that influences teachers’ interpretations of their experiences that is used as a blueprint for their learning and teaching practice (Brauer & Wilde, 2018).

*Technology:* The integration of digital tools for application to support instructional practice and student learning (Bell & Gresalfi, 2017).

*Teaching style:* A teacher’s preferred style of teaching (Ovez & Uyangor, 2016).

*Technology integration:* The practice of including technology into curricula and teaching practices (Khlaif, 2018).

*Twenty-first (21st) century skills:* Skills individuals must achieve to succeed as students, citizens and workers in society (Kivunja, 2015).

*Twenty-first (21st) century learning:* This is where academic subject proficiency must be developed with the implementation of 21st century skills (Kivunja, 2015).

### **Assumptions, Delimitations, and Limitations**

#### **Assumptions**

There were three assumptions that were connected to the research study. The first assumption was the belief that the participants chosen for the study would respond to the questions honestly. The participants may have answered honestly because I assured them that their confidentiality would be protected because of the steps taken to ensure that would occur. Additionally, the participants were assured that they could withdraw from the study without any consequences. The second assumption was that the sample chosen represents teachers who may



or may not have experience with technology. I assured participants that there were other participants in the study like them who may or may not have experience with technology who were being asked the same questions. This may have allowed them to feel at ease that there were other participants in the study like them. A third assumption was that many participants may have felt that technology integration will meet the needs of all learning styles including the teacher. Technology integration in some instances is affected by teachers who are focused on students' academic achievement and held learner centered belief (Liu, 2011). I explained to the participant that technology has become an integral part of our daily lives; therefore, integrating it in instructional practice does not have to be overwhelming. They can first begin by adding basic activities using technology.

### **Delimitations**

A delimitation is that the participants invited to be a part of the study were teachers who teach mathematics, language arts, science, or social studies. Secondly, the study was delimited to middle school teachers in one school and one state in the United States. Since my goal was to gain an understanding of participants' use of technology, the participants were teachers at a middle school who may or may not use technology. The participants included all certified teachers who taught a core subject; therefore, it was not necessary to use participants from other states or other school district to satisfy the study.

### **Limitations**

A limitation for the study was that the participants were from a school in the suburbs. It would have been notable to have participants from the city or from other school districts in the state. However, within the school district, many schools have access to technology; therefore,

using teachers from the suburbs was not likely to affect the understanding I was trying to gain an understanding about participants experience with technology. Additionally, most schools in the school district where the research study was carried out has some technology in their school. Furthermore, in a qualitative case study, the sample size is generally small; therefore, purposeful sampling is important. The teacher participants for the study were homogenous in that they had various similarities or simple characteristics. The teachers each taught a core subject and were certified to teach and work at the same school where the research study was conducted. This type of selection of participants design is practical when studying small research samples. Therefore, in this study the teachers who were selected match the type of study that was going to be conducted.

### **Summary**

In this chapter, I established the research study for the dissertation and gave an overview of how teachers experience with technology may provide an understanding of their learning and teaching style. Most existing research indicates a gap in understanding this issue which was evident when demonstrating the significance of the study, rationale, relevance and limitations of the study. In Chapter 2, I will review recent and current literature, and any findings related to this issue. The conceptual framework and the constructivist approach will be discussed and used to develop and construct the ideas and concepts that guided the study and helped me understand the meaning of the data collected.

In Chapter 3 I will discuss the research design, site, participants' information, data collection, analysis, ethical issues, and expected findings. In this chapter, I will provide answers to the epistemological question that structures the framework used in the research study. In

Chapter 4, I will discuss the data analysis and results and highlight the main points of the findings, while in Chapter 5, I will discuss the implications of the study, recommendations for future research, and a summary and significance of the study.

## Chapter 2: Literature Review

The purpose of this research study was to gain an understanding of how teachers' experience with technology provides an understanding of their learning and teaching style. To conduct the search for the literature review, I used Concordia University electronic online library databases. The data bases that were accessed were ERIC, Proquest, Education Source, and course materials posted under the class course. The database and course materials were used in my search for literature using peer review journal articles, books, and other documents discussing this topic. My focus in reviewing these materials was to gain an understanding about teachers' experience with technology as it relates to their learning style and teaching style.

In the literature review, I examined how technology can be used as a resource to bridge the gap between the teacher and the various learning styles represented in the classroom learning environment. I reviewed studies where teachers' experience with technology was shown to either help or hinder their learning style and teaching style. Additionally, I reviewed studies focused on the benefits of teaching and learning using technology in education.

To carry out this literature search I used key words or terms to help me gather literature that would be relevant to the research but not limited to those key words or phrases. These key words included *technology*, *learning style*, *teaching style*, *technology integration*, *teachers' belief*, *technology instruction*, *educational technology*, *technology pedagogy*, *constructivism* and *technology*. These words and terms guided the literature search and review. In the literature review, I focused on research studies conducted within the last five years, though I included some resources older than five years because of the lack of studies on experiences of teachers

integrating technology in their pedagogy. This gap in the research gave me the opportunity to develop my research question and attempt to answer it.

### **Brief Background to the Problem**

The ubiquitous nature of technology in the 21st century impacts our day to day lives (Chuang, Weng, & Huang, 2015). As a result, schools are wired for technology access, because they have invested in various types of technology to keep abreast with the digital age. This has led to teachers being charged with the responsibility of integrating technology in the classroom to support students learning. For teachers' whose technology experience is limited integrating technology in their daily pedagogy can be challenging, and time consuming while for the more experienced teachers with technology knowledge it is easier to integrate in their daily instruction (Belo, McKenney, Voogt, & Bradley, 2016). In North Carolina, students in Grades 3–12 take an end of year state test which used to be completed using paper and pencil but in recent years Grade 6–12 state tests are done using technology. As a result, students must be familiar with technology in order to feel comfortable taking their state test using technology.

### **Understanding Learning Styles**

The selected literature demonstrated that researchers have worked on developing and defining a learning style theory within the educational arena for many years (Waters, 2012). Understanding learning style of both students and teachers is essential for academic success in for students (Almeida, 2012). Researchers have been actively involved in examining methods and ideas for helping individuals learn. As a result, the concept of learning styles was born, built on the idea that learning can occur in several ways (Wilkinson, Boohan, & Stevenson, 2013). Understanding how teachers learn may demonstrate if a teacher's learning style determines how

they integrate technology in their classrooms. The term *learning styles* is defined as the way individuals can conceptualize and recollect information regardless of the task or problem they must complete (Berry & Settle, 2011). Normally, the learning styles that individuals use to learn are visual representation, auditory, or kinesthetic (Willingham, Hughes, & Dobolyi, 2015).

Learners employ one of these learning styles because they must learn large amounts of information within a short period of time. Learners are also taught by a variety of teachers who have their own learning and teaching styles. Styles of learning include cognitive learning which focuses on the methods students use for cognitive assignments, which helps them understand their world, while learning preference focus on how students prefers to receive instruction (Wilkinson et al., 2013). Despite that, learning approaches refer to how learners apply strategies when reviewing and sorting information to understand their learning task (Wilkinson et al., 2013). As a result of this, various measuring tools and instruments have emerged to help teachers understand and support students' learning styles.

These tools are beneficial in supporting teachers determine the cause of students' academic challenges and improve teachers plan and differentiate instruction for struggling learners (Dunn & Honigsfeld, 2013). The importance of understanding learning styles is vital because federal legislators have mandated that teachers find a way to improve students' academic success in the classroom (Dunn & Honigsfeld, 2013). As a result, many school districts have implemented well-packaged intervention programs to enhance instruction and academic achievement. These intervention programs sometimes create challenges for teachers because they may not have the training for these programs which they are responsibility for implementing in their classroom pedagogy while ensuring that learners benefit from it (Dunn &

Honigsfeld, 2013). Along with these programs, the Department of Education has spent millions of dollars on projects to create ways to train teachers on how to integrate technology in their instructional practice to support student learning (Hsu, 2016).

In examining the history of learning styles for over 40 years, more than 860 research studies have been conducted at over 135 institutions of higher education on a learning style model (Dunn & Honigsfeld, 2013). This kind of push for research on this topic demonstrates the interest in learning styles. Descriptive correlational research studies provided ample data about the learning styles of various achievement ages, male, female, national and brain processing groups (Dunn & Honigsfeld, 2013). The literature revealed these studies uncovered that by understanding learning style individuals can be taught how to acquire and store new and challenging information using various approaches, methods and materials that can be effective for a learner (Dunn & Honigsfeld, 2013).

In addition, understanding learning styles can support and improve instruction when teachers use intervention approaches. It supports teachers as they acknowledge the diversity of students learning needs and respond to those needs through adjustments of instruction using tools such as technology to support learning (Dunn & Honigsfeld, 2013). One issue with using learning style models to understand learning approaches is that it presents an unrealistic burden on teachers. Teachers would have to routinely change their teaching methods or style in order to include all the learning styles in each class that they teach (Popescu, 2010). To alleviate such burden for teachers, e-learning using technology could be included to support teachers' pedagogy through individualized learning plans for students who need support to help them succeed in the classroom environment (Popescu, 2010).

## **Learning Style Instruments**

In the 1970s, learning styles unfolded as a framework to enhance and support teaching instruction and assist in understanding students learning styles (Brew, 2002) since learning styles is believed to be an extension of an individual's personality (Hawk & Shah, 2007). Its characteristics falls under the guise of dispositional traits and adaptations as a result of human differences and similarities (Hawk & Shah, 2007). Proponents of learning styles who supports the notion that learners learn in various ways noted that educators' mentality and predisposition for learning should be wide enough to encompass all learning styles (Hawk & Shah, 2007). This would allow educators and students to grasp and embrace necessary information and become successful learners (Hawk & Shah, 2007).

With the development of various learning style models over the past 30 years, greater attention has been brought to understanding various approaches student use to learn in their daily academic activities (Hawk & Shah, 2007). Researchers have reviewed and examined various approaches and validate which ones have been effective for learners. Of these approaches, there are six main learning styles instruments that educators generally employed when determining an individual's learning style. These include Kolb Experiential Learning, Gregorc, Felder and Silverman, Vark, Dunn and Dunn, and the Rasi Model (Hawk and Shah, 2007). Educators may choose one of these when investigating students' learning differences. It can also be used as a result of the diversity of learners present in the classroom to improve achievement with an optimistic view of designing pedagogical instruction that will benefit all student learners (Scott, 2010). This is with an expectancy that with effective pedagogical designs learners will be able to grasp and understand information better as they learn (Dunn & Honigsfeld, 2013).With a



growing and diverse student body represented in the educational system, it is important that educators take into consideration students learning style, and how students best learn in order to teach and implement the curriculum comprehensively and effectively so that students can experience academic success in school. In 2002, the U.S. Congress legislated the No Child Left Behind Act (NCLB). This was due to policymakers attempt and ongoing search to upgrade K–12 public school educational system and make American students competitive with the rest of the world (Thompson & Allen, 2012).

### **Examination of two Models**

In addition to seeking to upgrade K–12 education, teachers have been instructed what to teach and how to teach students. Teachers' implement various intervention programs and technology use because they have been instructed to so with very little training as to how to do so with the goal to improve academic success in the classroom (Lovelace, 2005). With the growing increase in class sizes a variety of learning styles is represented in a classroom environment. There are several learning styles instruments that are available for implementation in the classroom, however there are two instruments that are utilized often to meet the needs of students in the classroom. Both learning style models have been used to determine and meet the needs in diverse classrooms filled with various learning styles to enhance learning outcome. These models are the Kolb Learning Style Model and the Dunn and Dunn Learning Style Model.

Kolb Learning Style Inventory Model, which is a widely used assessment, has been noted by researchers as an unreliable tool for gathering assessment information (Koob & Funk, 2002). David Kolb, the architect of this model, developed this learning style instrument to complement his experiential learning model (Brew, 2002). His model has been used in over 150 studies in

which users have criticized this model because of issues with the psychometric properties (Koob & Funk, 2002). The problems associated with the psychometric properties of Kolb's Learning Style Model is that it has a weak construct validity, and reliability which creates the possibility of response bias and questionable stability as a result of moderate test retest measures (Brew, 2002). These problems resulted in a recommendation that teachers be careful about using this assessment because of the validity of questionable results (Brew, 2002). With questions being raised about Kolb LSI, Kolb noted that this learning style instrument was to be used as a beginning approach to gathering information about how individuals learning habits (Brew, 2002).

**Development of the Kolb Learning Style Model.** Kolb's theory of experiential learning unfolded as a result of the theories and work of John Dewey, Kurt Lewin, and Jean Piaget (Pickworth & Schoeman, 2000). These theorist works were instrumental in the development of Kolb model of experiential learning, learning abilities and learning styles (Pickworth & Schoeman, 2000). This direction towards understanding various learning styles in the classroom sometimes referred to as transformational learning has been viewed as sound alternative to the traditional pedagogy (Manolis, Burns, Assudani, & Chinta, 2013). Researchers involved in examining Kolb's noted that this model offers several theoretical views which encompass cognitivism, phenomenology and adult learning (Manolis et al., 2013). Although the learning style inventory is widely used, and Kolb's has attempted to improve the learning style instrument scale the instrument still has flaws which affect its use by users. Some limitations with the Kolb's Learning style inventory (LSI) are that it has low reliability, questionable and poor predictive powers (Manolis et al., 2013). In addition, the instrument is geared towards

individuals who can the architect believed has only one learning style (Manolis et al., 2013). As a result, some researchers and educators believed that a revised instrument was necessary which would be easier to implement and support the idea that individuals could acquire more than one leaning style (Manolis et al., 2013).

**Components of Kolb's Learning Style Model.** The Kolb model demonstrates how learning is formed by way of a transformational experience (Hawk & Shah, 2007). In addition, it displays a four-mode learning cycle beginning with a Concrete Experience (CE), then to a Reflective Observation (RO), next to an Abstract Conceptualization (AC) and then to an Active Experimentation (AE) (Hawk & Shah, 2007). Within this model when all four learning is utilized, learning for an individual is complete and successful, however learning can begin at any of the learning mode in the cycle (Hawk & Shah, 2007). As learners' cycle through the experiential learning model they use their learning style to help them. They gathered information from the self-scoring assessment learning style inventory that individuals use to determine their dominant learning style (Pickworth & Schoeman, 2000).

**Development of the Dunn and Dunn Learning Style Model.** The second learning style model that was developed with a long broad research base background was the Dunn and Dunn Learning style model (Lovelace, 2005). This instructional model was researched, improved, and developed by at least 19 professors and over 200 graduate students (Lovelace, 2005). This model has been useful and attractive to educators because it has a strong research base background as oppose to some that may have a limited research base that does not yield the achievement outcome that proponents promise (Lovelace, 2005). Programs such as those that do not produce academic success for students generally disappear after about three years (Lovelace,

2005). The Dunn and Dunn Learning Style Model is viewed as one that allows students to focus, process, retain and understand challenging information when implemented effectively (Dunn, Honigsfeld, & Doolan, 2009).

The model includes 20 to 21 elements depending on the age of those being assessed using this model (Dunn et al., 2009). These elements are organized into five stimuli: *Environment* (sound, light, temperature and seating design), *Emotional* (motivation, task, persistence, responsibility, and structure), *Sociological* (learning alone, in pairs, with peers, as part of a team, with authoritative or collegial teacher, with social variety or patterns), *Physiological* preference (perceptual strength, auditory, verbal/kinesthetic, visual text or visual picture, tactual and / or kinesthetic, and intake, time of day energy levels and mobility), *Psychological* (analytical versus global and impulsive versus reflective characteristics) (Dunn et al., 2009). With this learning style model, individuals are analytical or global processors, or they can use an integrated synthesis of both (Dunn et al., 2009).

The theory under which the Dunn and Dunn Learning Style Model is based on is that the most individuals can learn, instructional environment must respond to the diversity of learners, everyone has a variety of strength and weakness, and individual instructional learning preferences are real (Lovelace, 2005). In addition to those suggestions, the theory further indicated that teachers should attempt to use learning styles as the foundation of their instructional practice, and students should use their learning style preference to help them when they must learn new and challenging information (Lovelace, 2005). It is also noted that in responsive environments, students statistically achieve high attitude test scores (Lovelace, 2005).

A meta-analysis examination of 76 experimental studies was carried out using the Dunn and Dunn model between 1980 and 2000 (Lovelace, 2005). The effectiveness of the model was assessed using a sample size of 7,196 participants (Lovelace, 2005). Lovelace (2005) study concluded and revealed that using the Dunn and Dunn Learning Style Model was effective in improving student achievement and students' attitude towards learning. To determine this, a quantitative analysis approach was conducted with the participants.

Although the meta-analysis that was conducted by Lovelace (2005) indicated success when the Dunn and Dunn Learning Style Model were implemented in the classroom there have been several criticisms about the findings. One criticism is that there was a lack of random assignment for participants when the research was conducted (Klitmoller, 2015). This was as a result of other variables that were not taken into consideration such as gender, IQ, previous achievement, and teacher to student ratio when the research was conducted (Klitmoller, 2015). In addition, the general claim that is was indicated by Lovelace (2005) finding using the Dunn and Dunn Learning Style Model have been questioned. This is due to other researchers using the same research designs and coming up with inconsistent results. Other criticism of the Dunn and Dunn Learning Style Model noted that the definition of "new and difficult information" was not defined in the research (Klitmoller, 2015).

In addition, other criticisms levied by Kavale and LeFever (2007) noted that Lovelace's (2005) research had conceptual and practical problems. First, the researcher failed to compare the Dunn and Dunn Learning Style Model to other models which would have given a better insight about the efficacy of the instructional practice used when implementing this model (Kavale & LeFever, 2007). Another criticism is that the Lovelace (2005) research had missing

information. Her research did not report the measure of variability therefore it limited the interpretation of mean value. In fact, Kava1e and LeFever (2007) noted that many educational intervention programs displayed more variability in its findings than effectiveness. Lovelace (2005) research findings showed many technical advances but it failed to address previous issues that the Dunn and Dunn Learning Style Model did not address.

### **Mismatch Between Teacher and Student Learning Styles**

Studies have indicated that there is a critical mismatch between teachers and students. This mismatch can produce negative ramification such as poor attention, and poor academic achievement for students as a result of the difficulty in grasping information that is being taught in a learning style other than their own. In academic areas where the material is challenging to students the added task of learning with a one learning style can increase the challenge of understanding the material (Berry & Settle, 2011). Within a classroom a large percentage of the students will consistently be a disadvantage learner because of the mismatch between teaching style and learning style (Damrongpanit & Reungtragul, 2013). In addition to being at a disadvantage and having a low academic success, these students may have a negative self-concept, they may get bored in the class, display aggressive behavior and possible dropout of school (Damrongpanit & Reungtragul, 2013). This has resulted in the suggestion that educators should examine their teaching style and their students learning style and then design classroom activities to meet their diverse learning style (Damrongpanit and Reungtragul, 2013).

Research was conducted by Damrongpanit and Reungtragul (2013) that identified the learning style of ninth grade students and identify the teaching style of four subject teachers to compare the academic achievement between matching conditions of learning styles and teaching

styles. The participants included 3,382 ninth grade students and 440 teachers gathered from random sampling (Damrongpanit and Reungtragul, 2013). The subject areas that were considered were Mathematics, Science, English, and Thai Language. To carry out this investigation, the researchers used a learning style questionnaire for data collection, a teaching style inventory and the academic subject achievement (Damrongpanit & Reungtragul, 2013). The results showed that students' academic achievement in comparison to the difference to the student's learning style and teaching style showed statistical significance at 0.05 (Damrongpanit & Reungtragul, 2013).

In comparing matching and mismatching between student and teacher in the four subject areas Mathematics matching 45% mismatching 55%, Science matching 35% mismatching 45%, English matching 15% mismatching 25% and Thai Language matching 50% mismatching 30% (Damrongpanit & Reungtragul, 2013). The results showed that the mismatch between learning styles and teaching styles can affect student success in the classroom. Students with a particular learning style who is mismatched with a particular teacher can lose interest in what is being taught and become bored (Damrongpanit & Reungtragul, 2013). Educators in higher education who may be unfamiliar with learning styles models and their benefits as it relates to enhancing students' academic achievement are generally uncomfortable with using it in their classrooms (Hawk & Shah, 2007). As a result, they continue teaching in their own preference of learning style because utilizing a learning style model would take them out of their comfort zone (Hawk & Shah, 2007).

The effects for teachers can be substantial if they are unwilling to move out of their comfort zone. If teachers are unwilling to utilize a learning style model to help them meet the

needs of a diverse classroom, they would likely reach only some students if they believe one teaching approach would link all students (Hawk & Shah, 2007). However, integrating technology as another learning approach magnifies the visual, auditory and tactile learning style (Bennett & Parise, 2014).

### **Relevant Research About Technology**

Over the past three decades the growth of technology and its use in everyday life has increased drastically (Mitchell, Wohleb, & Skinner, 2016). Throughout the world countries invest in technology for their educational environment to prepare students to become technologically prepared to be able to meet the demands of their future jobs (Hosman & Cvetanoska, 2013). In the United States, the government has invested billions of dollars in schools' technology infrastructure (Liu, Ritzhaupt, Dawson, & Barron, 2017). The goal with such a large investment is to encourage and prepare students to master the 21st century skills in preparation for college and or for their future jobs (Wang, Hsu, Campbell, Coster, & Longhurst, 2014). With the enormous amount of money spent for technology infrastructure it has influenced many to research technology significance in educational classroom (Liu et al., 2017). The literature suggested that the integration of technology in a teacher's instructional practice is an important aspect for students' success in the classroom and future workforce (Mitchell et al., 2016).

Despite these benefits of integrating technology into a teacher's pedagogy it can be challenging for teachers' whose instructional practice may be geared towards a certain teaching style because they would have to change their instructional practice (Bell & Gresalfi, 2017). For example, although some teachers may increase their use of technology in the classroom its use



may occur infrequently or it could be implemented superficially because the teachers would have to change the way they teach so that they could include technology in their instruction (Thoma, Hutchinson, Johnson, Johnson, & Stroma, 2017).

One element that advances the successful integration of technology in the classroom is teachers' becoming more knowledgeable and more experienced with technology (Bell & Gresalfi, 2017). The more experienced and knowledgeable teachers are about technology the more successful the integration of technology in their pedagogy (Bell & Gresalfi, 2017). For example, to improve technology instruction for the 21st century teachers' must first learn and understand technology so that when it's integrated it in their classroom pedagogy students can construct their own understanding and make it applicable to everyday life (Ertmer & Ottenbreit-Leftwich, 2010).

With the diversity of learning styles represented in the learning environment bridging the gap between teachers' teaching style and their students learning style is necessary. Teachers are encouraged to try various strategies to improve student achievement. For example, with the availability and influence of technology within our society there is a drive to integrate technology as one of the resource strategies in the teaching and learning classrooms to improve student learning (Kruse, 2017). With school districts investing heavily in technology there is an expectation that teachers will create a positive blended learning classroom for students (Bingimlas, 2017).

To move a classroom to a student-centered learning environment where technology is consistently integrated teachers would have to include technology in their pedagogy. This may require them to change their teaching style which could create uncertainty and uneasiness with

technology especially if they lack technology experience (Howard & Gigliotti, 2015). This may also be viewed as a risk by teachers because of the demands of the curriculum along with them having to prepare students to take the end of year state test. The use of technology may not cure students' academic issues, but it could be used as a support to classroom pedagogy, and content being taught within a sometimes challenging learning environment for educators (Zisow, 2000).

The selected literature revealed how several studies have explored whether a constructivist approach to the use of technology in the classroom should be a part of the teacher's pedagogy and whether it has any effect on student learning or the teachers' learning and teaching style (Cohen, 2001). The constructivist approach allows teachers to construct their own meaning about technology integration through their experience. Researchers have conducted studies comparing the differences between a technology rich classroom and one that follows a traditional curriculum without technology to determine if there is a difference in academic improvement (Cohen, 2001). Their findings indicated that an environment with a limited use of technology does not support students learning styles or improve their academic success because of the inconsistent use of technology in the classroom (Viorica-Torii & Carmen, 2013). However, students from a technology rich environment noted that the heavy integration of technology improved their understanding of the materials taught to them and improved their academic performance (Cohen, 2001). As the use of technology continues to grow users use it for researching information, developing contents and collaborating with others within the learning environment (Bingimlas, 2017).

Some researchers argue that designing online assignments for students to support their learning may become tedious for the teacher because of the various learning styles and needs in

the classroom (Samah, Yahaya, & Ali, 2011). Time constraint, lack of technology experience and classroom size may impact teachers being able to design lesson using technology that supports various learning styles. However, because of students' early interaction with technology their cognition and social processes increases when technology is implemented in the classroom. This is due to their early interaction with computer games at an early age which results in students displaying higher cognition function which supports the belief that early technology integration in the classroom accommodates various learning styles (Hwang, Sung, Hung, & Tsai, 2012).

### **Role of the Teacher in a Technological Environment**

As the educational classroom continues to change, teachers need more professional development to help them adjust. These professional developments will help teachers organize their classroom in a way that makes room for the inclusion of technology. The selected literature discussed how learning environments are changing because teachers must understand how to teach in a technology rich classroom by including technology in their instructional practice. Professional development in technology can be helpful for teachers but many teachers participate very little professional development and sometimes do not see the value of it (Jones & Dexter, 2014). These professional developments courses are vital because teachers are responsible for trying and implementing new teaching strategies using technology because classroom population is becoming more diverse (Jones & Dexter, 2014). The literature noted that professional development for teachers in technology is necessary because it can facilitate collaboration among teachers about best practices for technology integration (Jones & Dexter, 2014). This type of

collaboration with other teachers can be valuable in supporting teachers with technology integration in their classroom (Jones & Dexter, 2014).

Through collaboration teachers will understand their primary roles in a technology rich classroom which includes components of a traditional classroom environment. Teachers' in these classrooms where technology is an integral part of their instruction understands that the classroom should be more student-centered rather than teacher centered. Teachers under technology rich student-centered classroom framework are viewed as organizers, authority figures, learners, and translators as described in the selected literature (Shaffer, Nash, & Ruis 2015).

### **Teacher as Organizer**

As the organizer where technology is integrated teachers provides opportunities for students in their classroom to be involved in various activities using technology. During these activities' teachers help students make connections and guide them by integrating technology to meet their learning goals (Shaffer, Nash, & Ruis 2015). This supports teachers to help students make connections to their experiences, and what they are learning in the classroom which helps them develop the necessary 21st century skills.

### **Teacher as Authority Figure**

In a technological classroom some of the content students learn requires an understanding of technology to complete the task. Teachers are then expected to be an authority of how to integrate technology for students to complete their task. Teachers' knowledge of technology is essential for technology-based content areas within the curriculum.

### **Teacher as Learner**

As the emphasis for teachers to use technology in their pedagogy to support student learning, teachers must be equipped to teach with technology in their classrooms (Jansen & van der Merwe, 2015). As a result, teachers must be open to learn about technology advancement and how to use it to measure students' academic success (Shaffer et al., 2015). This is important because students are growing up in a technological society which has influenced what it means to be technology literate (Jansen & van der Merwe, 2015).

### **Teacher as Translator**

As students become more engaged in technology rich learning classroom, they will receive feedback from individuals about their learning (Shaffer et al., 2015). Teachers are charged with the responsibility of helping students understand the various feedback they receive so that they will know what strategies they need to use to reach their learning goals and how to continue their academic progress (Shaffer et al., 2015).

To effectively manage these roles, teachers would have to keep their traditional roles in order to be able to effectively manage these new roles. These new roles can be advanced the use of technology. Various assessment and other data that teachers use to determine students' progress will continue to be used as teachers move in the direction that these new roles.

### **Technology Beliefs**

The literature indicated that veteran and younger teachers displayed deficiency in their knowledge and experience about how technology should be integrated in the curriculum to promote teaching and learning with technology (Chen, 2012). The assumption that teachers are not as knowledgeable about technology in comparison to their students create a divide between

students and teachers (Wang et al., 2014). This is an issue because it is believed that if teachers include technology in their classroom instructional practice student learning will be increased (Hsu, 2016). Teachers' belief about technology integration influences their teaching style and how they implement it in their classroom. Their pedagogical beliefs are guided by their psychological construct about their technology experiences that facilitates their teaching style (Hsu, 2016). In a teacher's constructivist learning beliefs, they view themselves as facilitators of student learning (Hsu, 2016). As a result, teachers who have constructivist thinking sometimes believe that technology should be integrated in the learning environment for inquiry-based assignments (Hsu, 2016).

However, in teacher centered learning environments, teachers feel they can achieve their teaching goals without using technology because they are knowledgeable about content they are teaching (Hsu, 2016). These teachers in a teacher centered learning environment generally believe that technology should be integrated in the classroom to teach remedial skills (Hsu, 2016). This constructivist learning beliefs by some teachers determines how technology is integrated in their instructional practice (Hsu, 2016). Some teachers may indicate that since they learned without technology their students can also learn without it. This belief limits both their students and their experience with technology as they try to figure out how to integrate technology consistently in the learning environment.

The selected literature noted that a teachers' self-efficacy can affect their integration of technology in their classroom. Teachers personal beliefs about technology use in the classroom influences how they use technology in the classroom as oppose to their pedagogical knowledge about technology (Hsu, 2016). Additionally, teachers' beliefs about technology could be guided

by their knowledge, ability and interaction with a variety of technology (Krause, 2017). This is essential because if technology is to be effectively integrated in classrooms, teachers' belief and confidence about the benefits of technology has be compatible with their teaching style (Kim & Kim, 2017). Teachers have questioned the value of technology in the classrooms as they wrestle with adapting to the value of integrating technology into the curriculum (Clarke & Zagarell, 2012).

The literature suggested that those teachers who had a positive view about technology used it often in their instructional practice (Hsu, 2016). Teachers who had a positive view about technology noted that technology enable students participate in four mode of learning (Hsu, 2016). These modes of learning were representation, information, transformation and collaboration (Hsu, 2016). These modes provide students with the opportunity to communicate and socialize with each other, discuss ideas and processes, and to discuss ways to make their task efficient (Hsu, 2016).

### **Teachers' Technology Experience**

The literature review indicated that there are ongoing discussions that some teachers are not prepared to integrate technology into their pedagogy as a result of their lack of experience and beliefs about technology. Although this is an issue, it is obvious that with the amount of money spent on technology infrastructure there is an expectation that teachers must successfully integrate technology in their pedagogy (Krause, 2017). Even with integration plans as well as having technology goals in curriculum standards some teachers still view themselves as ill prepared or they lack proficiency in technology (Krause, 2017). This is important because content standards which include technology goals are included in all subject areas and used to

guide instruction in teachers' pedagogy (Clarke & Zagarell, 2012). Teachers further indicated that to be able to integrate technology in students lessons it must connect with their beliefs and experience (Kim & Kim, 2017).

The selected literature revealed that technology integration depends on a teacher's ability and experience but other factors such as lack of training, lack of funds and not enough time during the day to include technology (Kim & Kim, 2017). Additionally, since computers are generally used for technology integration in the classroom teachers many teachers who lack technology experience uses it for basic activities such as word processing or lesson plans preparation (Kim & Kim, 2017). This primary use of technology demonstrated that some teachers are not very knowledgeable about technology and using it can become challenging (Hughes, 2005). Teachers understand that technology integrated practice demands practice and experience.

In the related literature review, experienced teachers have been portrayed as digital immigrants because of how they have responded to the demand for technology integration into their teaching and the need for learners to have technological skills (Chittleborough, 2014). The digital immigrants have been viewed as teachers who were born before new technology were available in society and born before 1980 while the digital natives are generally considered to be teachers born after 1980 (Wang et al., 2014). The older teachers are generally considered to be less knowledgeable about technology in comparison to the younger teachers. The literature found that some of the experienced or older teachers could be considered digital natives because of their experience with technology although they are known as digital immigrant because of



their age (Wang et al., 2014). The literature noted that less experienced teachers can close the gap between them and experienced teachers if they desire to do so (Wang et al., 2014).

The selected literature indicated that teachers are more likely to own various types of technology and participate in personal internet activities thus enhancing their belief in their technological skills (Wang et al., 2014). The younger teachers who are considered digital natives and more experienced with technology participated in more technological activities than the older teachers. The younger teachers who were born after 1980 technological activities included social networking and other personal activities (Wang et al., 2014). Therefore, the understanding that some teachers may struggle with technology integration in their instructional practice because of lack of experience should decrease (Wang et al., 2014). This is apparent because digital immigrant teachers who have been teaching for many years have made efforts to increase their knowledge on how to integrate technology in their instructional practice (Wang et al., 2014).

The selected literature established that the integration of technology is relevant in all subject areas. However, there was a focus on science teachers' technology experience because they were viewed as the teachers who possess the greatest capability to introduce new methods and ideas (Wang et al., 2014). This is so because in science using digital technology may help to make abstract things understandable. Digital representation such as simulations, interactivity or animations can be represented to enhance student learning (Chittleborough, 2014). Additionally, technology can be used to facilitate project-based learning, inquiry-based learning, hands-on-activities, field trips and large amount of data collection (Wang et al., 2014). These types of activities which can be completed in science labs can save time but in comparison to other

content area the teachers are more likely to integrate technology differently in their instructional practice (Wang et al., 2014). Teachers who believe that technology can improve their students' academic achievement understands that technology can be transformative in the classroom. They also realize that technology can create challenges for some teachers because they must adjust their teaching practice to integrate it in their pedagogy (Bell & Gresalfi, 2017). How teachers integrate technology could be a result of how they learned and process information.

### **Teaching With Technology**

The selected literature indicated that teaching training is the main reason for the lack of technology integration into a teacher's pedagogy (Ruggiero & Mong, 2015). Technology is not a panacea to improve student learning, but teachers' must be knowledgeable about how technology can be used to support the content student learn (Ruggiero & Mong, 2015). This is significant because technology has transformed teaching and learning on various levels (Mitchell et al., 2016). With this transformation teachers are expected to provide meaningful technology lesson which requires them to be knowledgeable about how to incorporate in classroom instruction which many of them battle against (Mitchell et al., 2016). One drawback about technology use in the classroom is when teachers decide that technology does not support curricular goals without attempting to use it in their instructional practice which causes students who would benefit from it to miss out (Mahajaan, 2016). This is a problem because students use technology in their daily lives therefore teachers are missing out by not tapping into another mode that could reach all students in their class.

The selected literature noted that teachers' implement their teaching style after sifting through their own knowledge bank and experiences to help students understand the significance

and relevance of what they are learning (Tondeur et al., 2017). This is essential for teachers because they are accountable for the learning that is experienced in their classrooms because they are responsible for the knowledge that is discharged in the classroom (Tondeur et al., 2016). Incorporating technology into teaching practices continues to cause uneasiness and unsettling feeling for many teachers as demonstrated in the literature (Howard & Gigliotti, 2016). The literature further indicated that teachers' lack of preparation to teach with technology was one of the dimensions that created many of their concerns about technology (Padmavathi, 2016). Although technology access in today's classroom has increased some teacher are more accommodating to including it in their teaching while others still struggle with doing so (Howard & Gigliotti, 2016). Teachers who have not incorporated technology consistently in their instructional practice are encouraged to do so by their school administration. This is essential to a school administration because schools have spent millions of dollars on technology with the notion that it will improve students learning outcome (Saxena, 2017).

Additional benefits include the opportunity to learn inside and outside of the classroom, quick access to vast amount of information, worldwide access to valuable information and, interaction with others without being concerned about location and personalized learning (Saxena, 2017). Additionally, students could conduct research and work with a diversity of tools appropriate for various learning styles (Saxena, 2017). The selected literature noted that teachers view these as benefits for students, however some teachers were concerned about taking a risk with their instructional practice by experimenting with technology (Howard & Gigliotti, 2016). Teachers who were open to changes by trying new innovations in their instructional practice believed the risk to improve student learning is worthwhile (Howard & Gigliotti, 2016). These

teachers are generally confident in teaching with technology in their classroom. They are also likely to teach using various tools so that they can reach all their students as a result of their willingness to take a risk to improve student learning.

These teachers are willing to take risks to improve their instructional practice because they value a more student-centered idea about teaching as a result, and they have a positive view about technology's impact on their students (Howard & Gigliotti, 2016). Their instructional practice embraces a more constructivist approach to student learning because their students' individual needs and interest takes precedence in their teaching practice (Tondeur et al., 2017). These teachers demonstrated that as they gain more experience with technology, their teaching style and learning style improved. In contrast teachers who were less likely to teach with technology lacked confidence viewed the benefits for their students as very minimal (Howard & Gigliotti, 2016). These teachers demonstrated that their knowledge about teaching practices that works were shaped by their teaching experience which is supported by consensus that their teaching instruction being teacher centered (Tondeur et al., 2016). Teacher-centered learning is where the teacher is viewed as the expert as the instructor in the classroom because the learning process and how students learn is controlled by the teacher (Tondeur et al., 2016). This is a practice that teachers who are experienced and have higher technology competency are willing to embrace.

### **Review of Methodological Issues**

A researcher can choose a research method that he or she determines will be valuable in responding to their research question. Research methods drive a research study investigation that is used for interpretation and drawing conclusions about the study (Almalki, 2016). In reviewing

the literature for this research study, many of the literature that was reviewed and used was from a qualitative approach. Since work is a qualitative research case study it was essential for me to understand how to carry out such study. The qualitative literature provided me an understanding about how to carry out such study. However, I also looked at quantitative research studies that used a mixed method approach because the literature discussed some components of my research question. Although my main interest was qualitative research, I incorporated information from the quantitative research that was relative to my research question.

The main purpose of qualitative research is to observe to answer the research problem methodically and analytically (Kilicoglu, 2018). The methods that are used to carry out a qualitative research includes identifying the problem, reviewing the literature, sampling, developing the research tool, collecting and analyzing the data and then reporting and interpreting the results from the data collected (Kilicoglu, 2018). Qualitative research study is uses verbal data in their study (Kilicoglu, 2018). The methods used for data collection provides a rich deep description with respect to the sample participants who are a part of the study (Eyisi, 2016). This description provides a broader understanding of participants' behavior and provides a vast amount of data to explain the phenomena that is being study in their natural environment (Eyisi, 2016).

The data that was collected in a qualitative research case study did not include numbers. The data was written information gather from the instruments that was used. The data was suited for this research case study because provided deep rich facts that describe the phenomena being study (Eyisi, 2016). As a result, several theories were evident from the data which was

constructed from the generated data (Eyisi, 2016). Additionally, the relationship between myself and the participants helped to guide the research for me to understand their experiences.

Although a qualitative research study method provides many advantages there are some challenges with this type of study. The findings from my research study were restricted to the sample group of participants that was studied (Eyisi, 2016). Another challenge is that repeating qualitative research study has brought about criticism. Some researchers contend that constructivist researchers do not use scientific steps such as inquiry and investigation because the research data is generated from participants experiences (Eyisi, 2016).

Quantitative research study uses statistical data which shorten the amount of time a researcher would have to spend trying to interpret the data. Scientific methods provide researchers the opportunity to make generalization when interpreting data (Eyisi, 2016). With quantitative data the researcher does not work closely with the sample participants. This makes it challenging for the researchers garner a deep understanding of the phenomena being studied in their natural setting (Eyisi, 2016).

Khlaif (2018) conducted a case study in which semistructured interviews were conducted with 15 teachers from five middle schools to gain an understanding about teachers' attitude towards teaching with technology. A thematic analysis method was used to analyze the interviews so that the researchers could gain a deeper understanding of teachers' experiences. This approach allowed the author to examine the influence technology has teaching and communication for teachers (Khlaif, 2018). This research case study conclusion indicated that although technology was given to these schools to facilitate teaching and to improve academic success among students' teachers attitude played a role in its integration. The finding

demonstrated that when teachers had a positive attitude, they would integrate technology in their instruction (Khlaif, 2018). Other factors that impacted their attitudes were experience, or intervention design factors (Khlaif, 2018). This case study provided clear details in a way that was easy to understand because of the structured approach that was used. The way the research study was conducted was aligned with how a qualitative research case study would have been conducted.

### **Synthesis of Research Findings**

The focus of this literature review was to gain an understanding of teachers' experience as it regards to their learning style and teaching style. The literature studies that were utilized in this research study revealed several things about teachers and technology but more importantly it revealed that teachers experience with technology influenced their learning style and teaching style. Technology may improve teachers' teaching practice. Chikasanda, Otrell, Williams and Jones (2013) explained that on-going support such as professional development for teachers using technology will strengthen their knowledge as teachers 'modify their instructional practice. Teachers increased their knowledge about technology through professional development supports their efforts when they integrate it in their practice consistently (Kafyulilo, Fisser, & Voogt, 2016). It influences their collaborations with other teachers who use technology, they better understand their students learning needs and how to individualize work for students while adapting their instruction (Matuk, Gerard, Lim-Breitbart & Linn, 2016; Montrieux, Vanderlinde, Schellens, & DeMarez, 2015).

A second finding within the literature review was that learning beliefs and experience shaped a teacher learning style and teaching style (Brauer & Wilde, 2018; Bell & Gresalfi, 2017;

Hsu, 2016; Jepsen, Varhegyi, & Teo, 2015). These researchers used both quantitative and qualitative methods to answer questions relevant as to whether teachers experience with technology provides an understanding to their learning style and teaching style. The educational classrooms focused on teachers from various settings. Within these setting various types of technology was used which was important in this study.

This research study provided an understanding of technology integration in the educational environment and the challenges comes with integration. The research study indicated that teachers' constructivism plays a role in how and when to use technology in the classroom. The interpretation of these challenges along with teachers' belief and experience was consistent with the review of the literature. From the literature there is an understanding that technology is not a panacea for students learning, however it was considered as an additional tool for the classroom that can support student learning. From the literature review the government has spent a vast amount of money on technology for education therefore it is expected that teachers should try to include it in the pedagogy.

### **Critique of Previous Research**

The conceptual belief within the literature review is that a teacher's belief about the benefits of technology determines technology integration decisions as it relates to their instructional practice (Chen, 2012; Howard & Gigliotti, 2016). Teachers who were less experienced who questioned the benefits of technology noted that their students can be successful using traditional methods. There is a general belief that teachers with the least amount of years of teaching experience are likely to use technology in their pedagogy (Mitchell et al., 2016; Hughes, 2005). These claims described an opinion held by many researchers.



However, some teachers regardless of their years of experience are reluctant to change because they have held on to their traditional methods of teaching (Jansen & van der Merwe, 2015).

They believed a new educational model is not necessary which has resulted in them resisting this change (Jansen & van der Merwe, 2015). If teachers continue to resist changes in education because they believe their traditional way of teaching is better for students, how do they plan to expose students to 21st century skills?

Understanding how one learns is explained in the literature as the way individuals can understand and recall information regardless of the task or problem they must complete (Berry & Settle, 2011). Learning style impact on technology integration demonstrates that teachers' may not be able to distinguish between their learning style and the students learning style (Brauer & Wilde, 2018). If technology integration will help students' academic success, teachers must then reflect on their learning practices to facilitate changes on how to reach students with various learning style. This will allow teachers to develop connections between their learning and the students learning.

### **Summary**

The literature review focused on teachers' experiences with technology and technology integration in the educational environment as result of teachers teaching style and learning style. The discussion about technology integration in the classroom was viewed as a way for students to acquire the necessary 21st century skills needed for their future employment. Schools today have invested in various types of technology to keep up with the advances in technology. The integration of technology from kindergarten to 12th grade lies upon the shoulders of teachers who are responsible for the transmission of knowledge to the students they teach. Integrating

technology with fidelity in the classroom is essential because students have various learning needs and learning needs. To meet those needs teachers must have experience along with technology competency to support their students when they implement technology in their instruction. The discussion presented showed how teachers integrate technology according to their learning style and teaching style. A guiding question was examined to understand a teacher's experience with technology as it relates to their learning style and teaching style. A discussion was included to establish what was discussed in the chapter.

## **Chapter 3: Research Method**

### **Introduction**

In this study, I employed a qualitative research case study methodology and design. The procedures and design of a case study approach were appropriate for documenting the experiences of teachers using technology regarding learning styles and teaching styles. In addition, it allowed me to demonstrate whether students become more engaged with the use of technology and understand whether technology bridges the gap between the teacher and student learning styles. This case study provided a perspective from teachers working in the environment of the study (Hatch, 2002).

This study was significant because technology is ubiquitous; therefore, it could be a tool to implement consistently in the classroom as a result of the various learning styles represented in the classroom. Because a teacher's teaching style and a student's learning style are not necessarily matched, a student's academic achievement can be hindered (Letele, Alexander, & Swanepoel, 2013). Such an obstacle can give rise to innovative ideas that could be utilized to bridge the gap between a teacher's teaching style and student's learning style. Technology can be used in an innovative way to demonstrate how a teacher's experience can support and bridge this disparity (Fenton & Ward, 2014).

In this chapter, I will focus on discussing the research question, the purpose and design of the study, and the population of the study. In addition, I will discuss what instrumentation I used to collect data and the attributes of the participants in the study.

## **Research Question**

Well-articulated research questions are important to a study for several reasons. They guide the investigation by providing a basis for the study, its boundaries, focus, direction and design elements, and they are an evaluative tool in completing the research (Hatch, 2002). Furthermore, when a particular area is being explored to contribute to the knowledge on the topic, the research question provides direction of the study (Hatch, 2002). Additionally, the research question provides a link to what is being studied in that the data gathered about teachers' experiences with technology may indicate whether or not it has affected their learning and teaching styles. The findings from the research study added to the phenomenon that is being studied.

The research question for this study was: How do teachers' experiences with technology provide an understanding regarding their learning and teaching styles?

## **Purpose and Design of the Study**

The purpose of this qualitative case study was to gain an understanding about the firsthand experience of teachers' use of technology in light of their learning style and teaching style in the classroom. The literature demonstrated the need to add to the body of knowledge about these experiences. A single case study is designed to illustrate a phenomenon among participants being studied in their natural setting to make sense of the phenomenon (Creswell, 2013). Case study research requires an extensive collection of qualitative data to help understand a specific issue from which conclusions and assertions are formed (Creswell, 2013). I explored teachers' approaches to using technology in various subject areas and answered the

research question with data compiled from multiple sources of information including interviews, observations, and member checking (Stake, 1995).

Constructivism served as the conceptual framework for this study. Following the constructivist approach supports the case study design (Hatch, 2002). With this approach, a single group was constructed of the participants in the study who experienced the world from their viewpoint. As a result of the knowledge gained using the constructivist paradigm, I interpreted the participants' experiences, per the recommendation of Hatch (2002).

### **Research Population and Sampling Method**

This study took place in a large suburban area at a middle school in North Carolina. The school population was about 1,300 students at the time of the study. The school district was comprised of students from various ethnic and socioeconomic backgrounds. The district high schools followed a traditional school calendar while the middle school and elementary school followed either a traditional or a year round school calendar based on administrators' decisions. Generally, students attended the school closest to home.

The Grades 6–8 middle school was seven years old and followed a year-round calendar. Students were placed on one of the four tracks for the school year and normally remained on that track until they left school. The school calendar was broken up into four nine-week quarters; at the end of each quarter, the students get a three-week vacation. The school improvement plan for 2016–2018 indicated that the student population is made up of Asian, multiracial, Hispanic, African American, and White students.

The teacher population was made up of Asians; Hispanics; African Americans, and White. In addition, 100% of the teachers at the school were fully licensed, 6% were beginning

teachers; 29% were National Board Certified Teachers, and 38% had advanced degrees. The school also had a low teacher annual turnover rate. The teachers for the study included four men and five women, some with bachelor's and some with master's degrees. In the study, I used purposeful sampling to guide the research because it allowed me to gain a better understanding of the issue that I was researching, per the recommendations of Hatch (2002). The participants chosen had the potential to include teachers who shared some common characteristics and differences within the group, which, according to Hatch (2002), can have the potential to help in finding themes as the study progress. Additionally, participants recruited were those who made themselves available, willingly participated in the research, and could purposefully give essential information that shared their understanding of the research question. The information collected from the participants was vast, detailed, succinct, and specific, per the recommendations of Creswell (2013). Because this study was designed to better understand how the participants' learning and teaching style relates to their experience with technology, the sample size consisted of nine teachers. I determined who would be a part of the research study by sending recruited participants a letter inviting them to be a part of the research study.

### **Instrumentation**

In a qualitative research study, data are collected by examining of documents through interviews, observations, and member checking (Creswell, 2013). As a teacher at the school, I had access to the teachers who took part in the study and had school and district permission to conduct the research study. I created interview questions to gather data and interview teachers at their convenience. Observation as a data collection tool was used with a checklist I created. I

used member checking to verify the accuracy of the information and to triangulate the data for trustworthiness, per Stake (1995).

### **Interview**

Qualitative interviews create an interaction with the participants where the researcher asks open-ended questions (Hatch, 2002). Using open-ended questions allowed participants to describe and explain their unique viewpoints and experiences about technology (see Stake, 1995). During the interview of participants, I took notes and ask for clarification when necessary to ensure the accuracy of the data being collected (see Stake, 1995). This was necessary because understanding what the participants mean in their responses was more important than getting their exact words (Stake, 1995). During the interview, I asked eight questions of the participants (see Appendix B). The responses to these questions made up the data that was analyzed.

### **Observation**

The purpose of observation was to understand participants' experience with technology from their perspective (see Hatch, 2002). Observation increases the understanding of the research investigation being conducted because the information collected will be used for analysis and reporting (Stake, 1995). Observational data is effective for qualitative case studies because it gives firsthand experience to inductively discover participants' understandings and experiences in their settings (Hatch, 2002). During an observation, sensitive information can be learned as a result of participants' reluctance to share during the interview (Hatch, 2002). To make the observations most effective, I used a checklist to collect data from the participants

where they are in their setting (see Appendix C). The checklist included specific questions that helped with the data collection.

### **Member Checking**

Member checking was used so that the participants could review the data for accuracy and acceptability of the information collected (see Stake, 1995). Some participants also provided alternate interpretations of the data collected and other information that they suggested should be included in the data, which follows the expectations set by Stake (1995). In order for the participants to check for accuracy of the data collected, I shared a folder using my Gmail account with the participants. They received a link to access their folder which was password protected so that they could check the accuracy of the data collected.

### **Data Collection**

Data collection is a complex process that includes carrying out a proper sampling strategy, gaining permission, developing a solid strategy for recording information and how to store it, and considering ethical issues that may arise (Creswell, 2013). Before collection began, I considered the type of data I would need for the research study, when I planned to begin the data collection, what strategies I planned to use to determine when I had enough data, and whether the data collected answered the research question, per Hatch (2002). I also employed triangulation and using unobtrusive data.

### **Triangulation**

Triangulation is a method used to check for accuracy and to validate the research study (Stake, 1995). The data sources and collection helped to ensure credibility and validity of the research because of the multiple data sources and methods I used to answer the research



questions (see Creswell, 2013). I used interviews, observation data, and member checking to authenticate the data I collected. These were records of information that could not be observed but were essential in answering the research study (see Stake, 1995).

Using interviews, observations, and unobtrusive data helped give me a clear understanding of data collected from the participants. The interviews and observations were collected as raw field notes taken on a note pad, per Hatch (2002). The notes collected will be detailed to ensure correct representation of the information collected (Hatch, 2002).

### **Unobtrusive Data**

Unobtrusive data is data that gives an insight into the phenomena that is being examined (Hatch, 2002). This type of data is not affected by interpretation, perception, or biases by the participants that are being studied. Unobtrusive data may include personal communication, records, documents, or artifacts (Hatch, 2002). These data also provide their own story independent of what information shared by the participants. Triangulating unobtrusive data with other types of data such as interviews, observations, and member checking can improve validity in research findings based on the information reported (Hatch, 2002).

### **Identification of Attributes**

Attributes can be both abstract and concrete (Creswell, 2013). Teachers' experience with technology may be positive if implemented properly in their instructional practices. Technology is the application of digital artifacts to support teaching and learning in the academic environment (Bell & Gresalfi, 2017). It is ubiquitous in 21st century learning, because teachers can use it to meet the needs of all learning styles represented in the classroom. When students use technology, it supports their learning and provides another mode of learning for the various

learning styles in the classroom. For example, if the teacher determines that the use technology through social media increases student participation and academic achievement then the teacher could consider using it more in the classroom (Chen, 2015). Students can use technology to collaborate, learn and support each other. Teachers' technology experience was measured through interview questions, observation, and member checking.

### **Data Analysis Procedures**

To conduct my research study, I chose participants whose technology experience I was not privy to. I used Hatch's (2002) nine-step inductive analysis approach, which fit the research design. These nine approaches to inductive analysis included identifying frames of analysis; creating domains as a result of relationships that may be found from the frames of analysis; identification of domains and code them; identification of relationship in the data; identification if domain is supported by the data; complete analysis of domains; identification of themes; identification of relationship within domains; and choose data to support data (Hatch, 2002). This approach revealed the participants' experiences by beginning with specific information and finding connections among the collected data. By using this approach, I was able to find patterns to better understand participants' experiences. The nine steps Hatch described are:

#### **Read the Data and Identify Frames of Analysis**

The frame of analysis provides the parameter for analyzing the data and may change during the procedure but will essentially be the elements that will be examined for the research study (Hatch, 2002). To conduct the data analysis for this study, I read the data thoroughly and then determined what parts will be analyzed, which will become the frame of analysis, per Hatch (2002).

### **Create Domains Based on Semantic Relationships**

Next, I searched for domains to determine if categories of meanings may be developed using the responses of the participants from their interviews, per the recommendations of Hatch (2002). This is an important stage because this is a systematic way to develop domains through the exploration of relationships within the frame of analysis (Hatch, 2002). Finding these domains helped me understand how the participants structure their experiences using technology.

### **Identify Salient Domains and Assign Codes**

After identifying the domains, I assigned codes as a way of organizing my data and keeping track of my domains. The codes help researchers decide which domain will be essential to answering the research question (Hatch, 2002). I used an outline format of numbers and letters to organize the information and created domain sheets with categories that had the potential to produce more data for further investigation (Hatch, 2002). The simpler the data, the easier it may be to analyze, because more complex data may require more individualized interpretation (Stake, 1995).

### **Reread Data and Refine Salient Domains**

When I collected all my data, I determined the relationships among the data, per Hatch (2002). Coding the information made it easier to discover new relationships, identify relationships among participants' responses, and revise domains that may need revision (Hatch, 2002). This was beneficial in the next step of determining data information that was essential to the research study.

### **Decide if Domains are Supported by Data**

Deciding if domains are supported by the data was also necessary; therefore, I had to evaluate the caliber of data that was to be included in creating the domains, according to the recommendations of Hatch (2002). Additionally, I determined if ample data was collected to support the domains in the setting where the research was being conducted. I determined saturation was reached in my data collection at that time. However, when data appeared several times in my analysis, I determined the relationships that were indicated were in the collected data. On the other hand, I made sure other examples of data that did not appear frequently but were important to the research study were evaluated and taken into consideration, per Hatch (2002). This was necessary because counterevidence was essential to finding data that could negate domains that were discovered, according to Hatch (2002).

### **Complete an Analysis Within Domains**

In this stage, according to Hatch (2002), the analysis of the domains may become deeper and richer to identify complexities. At this point, I evaluated the data that could bring forth new relationships and new domains while reviewing the original domains. I did this by revisiting various terms and relationships, taking into consideration that subcategories may be organized under each relationships or common terms gathered from the data. This complexity within the data analysis indicated the depth and richness that could be noted from the data analysis and findings.

### **Search for Themes Across Domains**

As I analyzed the data, themes emerged that indicated possible connections among the domains. This may have been because parts of the data were linked, which could create patterns

about the participants' experiences. By completing domain, I began to understand how all the data parts fit together using a systematic comparison approach among the identified domains (Hatch, 2002). This included searching for similarities and differences, analyzing the differences among the domains, and identifying overarching themes.

### **Create a Master Outline**

Next, I created a master outline demonstrating the relationships among the domain. This outline succinctly showed all the analyses and how they all fit together in the research study. The master outline helped me to fine tune my analysis of the data, and created a structure and a guide for me to write about my findings.

### **Select Data Excerpts to Support Elements in Outline**

Before writing about my findings, I read the data within the domains again to locate data excerpts such as quotes to include in Chapter 4, per Hatch (2002). Using an inductive analysis helped me understand complex data. In addition, it provided a systematic approach to understanding a vast amount of data about experiences of the participants. By using the inductive analysis approach, I was able to analyze the complex data I collected (Hatch, 2002). Additionally, it helped me systematically process a vast amount of data that could be modified for the research paradigm (Hatch, 2002).

### **Limitation of Research Design**

In creating my research design, I considered the limitations and delimitations that could restrict the study. Hatch (2002) noted, "Participants are the ultimate gatekeepers" (p. 51). Participants are pivotal in a research design. They decide to what extent proper access to the data collected is authentic (Hatch, 2002). Therefore, I developed and sustained a relationship

with the participants throughout the study. I employed purposeful sampling methods when selecting the participants to ensure integrity of the research, per Hatch (2002). The standards used for participant selection were the result of the kind of study being conducted. Participating teachers agreed to allow me to conduct my research study in their natural environment, thus removing the potential limitations of having access to them.

### **Delimitation of Research Design**

Participants were delimited to those who teach mathematics, language arts, science, or social studies and not an elective subject. I also conducted the research at one school and interviewed nine teachers. These participants were selected because they were in an educational setting and not because I knew anything about the frequency with which they used technology in their classroom instruction. Because I work at the study site, it was easier for me to develop a relationship with the participants in order to gather useful data about their experiences.

After the data were collected, I triangulated the data using multiple sources to provide supporting evidence of my findings and add to the validity of my findings. To justify my credibility, I checked with the participants about my findings and understandings of the data they provided so that they could examine its accuracy and credibility (see Creswell, 2013).

### **Validation—Credibility and Dependability**

In a qualitative study, trustworthiness and reliability of data are important. I employed strategies such as reporting rich and thick details to document the authenticity of my research study, per the recommendation of (Creswell (2013). I worked to build trust with the participants by checking with them about the information I collected so that there was no inaccuracy in the data collected. I also took care to triangulate the information from various sources to corroborate

the data that could be collected from the participants, per Hatch (2002). I used unobtrusive data to strengthen the consistency and stability of the data. These data did not affect the participants because they were collected without participants' involvement. These unobtrusive data were triangulated with other data from other sources to strengthen the research findings, per Hatch (2002).

### **Expected Findings**

In a qualitative study, the findings must be transferable between the researcher and the participants being studied (Creswell, 2013). The findings may change and may create instability if there are inaccuracies in the data (Creswell, 2013). Because I wanted to better understand participants' experience with technology, I centered the study around one research question: How do teachers' experiences with technology provide an understanding regarding their learning and teaching styles? I expected to find that some of the participants were comfortable with technology while some became anxious if they needed to integrate it in their classroom instruction (see Howard & Gigliotti, 2016). I also expected participants' fears and anxiety would need to be addressed to provide them with a better experience with technology, per Howard and Gigliotti (2016).

The expected findings helped fill the gap in the literature by addressing teachers' comfort with technology in light of its increased use in many school districts. Additionally, the information gathered demonstrated that there is a need for further exploration on this research study topic.

## **Ethical Issues of the Study**

Before carrying out my research study, I obtained permission from the Concordia University–Portland Institutional Review Board, the school district, and the school. Next, I ensured that participants received and signed a consent form, which included a full disclosure of the research study goal along with a clear understanding that their participation was voluntary (Hatch, 2002). I also offered a short, written explanation of the intended case study for participants to review, per Stake (1995). I took care when conducting the study and used methods to reduce risks as needed, per Hatch (2002).

I explained to participants who would have access to the data along with the plan for storage and disposal of the data, per the recommendation of Hatch (2002). Potential participants were invited to be a part of the case study research. In some cases, I emailed the participants to check if they received their invitation letter and if they had questions. After the research study was conducted, I provided copies of the participants' responses for each individual to check for accuracy.

My role as the researcher in this case study was determined by what task needed to be accomplished at the time. However, the most important role for me was as an interpreter and one who will gather data for the study, per Stake (2002). The knowledge gained from the research study was constructed to gain an understanding of the participants' experiences. As the researcher, approaching the findings from a constructivist view allowed me to gain an understanding from others' experiences.



### **Potential Conflict of Interest**

Potential conflicts of interest in the research study may influence the findings of the study. These conflicts of interest could occur if participants' roles and expectations are not clearly defined. To avoid conflicts of interest, I explained the participant's role and expectations for the research study to each participant. Each participant was then provided with an informed consent form to fill out which indicated that they agreed to be a part of the research study, per the recommendation of Hatch (2002).

In addition, participants were assured that their confidentiality would be protected. I explained to them that the information collected would be used solely for this research study and that care would be taken in ensuring protecting their anonymity. All data received will be stored and kept by me, the researcher.

### **Summary**

In Chapter 3, I detailed the methodology used in this qualitative case study design. Using the case study approach, I presented the research question and provided information about the sampling procedures, instrumentation, data collection, data analysis, limitations, ethical issues, and my role as the researcher. In Chapter 4, I will provide a description of participants and summarize of the findings from the data collected.

## **Chapter 4: Data Analysis and Results**

### **Introduction**

In this chapter, I will present an overview description of the data that were used for this single case study. A single case study was designed to examine and understand teacher's experiences with technology regarding their learning style and teaching style. The participants in the study were interviewed, observed, and given the opportunity to check their interview data for accuracy and the opportunity to add additional information that they may deem necessary. A qualitative single case study methodology approach provided a way for me to explore participant's perspectives and experiences in depth. It also provided insight into the participants' experiences that could not be observed, per Hatch (2002). The framework used for this case study was inductive analysis, which guided the research as I put together the collected data (Hatch, 2002). Data analysis gives meaning to the data and helps answer the research question (Stake, 1995).

I interviewed nine teachers at a middle school in North Carolina. These teachers taught students in sixth grade to eighth grade in the subjects of math, language arts, science, or social studies. The study focused on one research question: How do teachers' experiences with technology provide an understanding regarding their learning style and teaching style? As a teacher who works in a school that is technology driven, I wanted to understand if teachers implemented or used technology in their instructional practice, and its significance in their learning style and teaching style. I used a constructivist approach for the research question and conducted face-to-face interviews with the teachers, engaging in observation using a self-created

checklist and then concluding with member checking for each teacher participant. After the data collection, the process of data analysis was the next step and is presented in this chapter.

### **Description of the Sample**

Participants are vital to qualitative research because they decide if the researcher obtains the information they need and to what extent they will give information (Hatch, 2002). As a result, purposeful sampling was necessary for this qualitative case study research (Hatch, 2002). I sent out nine invitations to participants who teach at a middle school who had daily access to technology and various level of technology experience. All nine teachers who were invited agreed to be a part of the research study. I assigned a pseudonym to protect the participants' identity. The participants included four males and five females who taught Mathematics, English Language Arts, Science, or Social Studies. They shared common characteristics such as they all teach regular education students, special students, and academic intellectual students (Hatch, 2002). Each participant had been teaching for a minimum of eight years. Table 1 shows the core subject and grade taught, as well as the years of teaching experience for each participant.

Table 1

*Participants*

Pseudonym	Core subject	Grade	Years of experience
Max	Math/Social Studies	6	18
Philip	ELA/Social Studies	6	8
Eileen	Science	6	30
Steven	Math	7	19
Patricia	Science	7	19
Kaley	ELA	7	14
Jack	Social Studies	7	8
Ally	Social Studies	8	8
Tessa	Math	8	30

**Max.** Max is a male teacher who is in his 18th year of teaching. He is a certified middle school teacher who teaches sixthgrade mathematics. Max’s father was in the military, so he has lived in various states throughout the United States. Max attended college in the South and has continued living in the South with his family. Max tutor students in mathematics after school. He also assists in running a chess club for interested students after school, and he is a member of the Positive Behavior Intervention Support team. As a mathematics teacher, Max’s pedagogy is driven by the notion that students can become good problem solvers. He believes that students should not give up when a problem is challenging because they will be able to transfer this attitude to real life situations. In addition, he noted that for students to succeed in class, they

must have the basic foundation in mathematics and be willing to work in partnership with him. He also indicated that technology use in his instruction allows students to become more engaged in his lessons.

**Philip.** Philip is a male teacher who was in his eighth year of teaching. Philip noted that he became a teacher because he did not want to work in the business world but preferred a career that he believed would impact other people. He decided to become a teacher because he believed that he could do more to impact students in the K–12 grades. He also stated that students needed to be more literate and if they had strong writing skills it gave them more power. He began his teaching career as an elementary school teacher because he wanted to teach all subjects so that he could teach the foundational skills to his students. Prior to his assignment at his present school, he taught special education students and regular education classes at the elementary level. At the middle school level, Philip taught language arts and social studies. Philip’s philosophy on technology in the classroom is that if it makes some activity more accessible to students and strengthens the quality of their work, he endorses its use. He further noted that management of work and differentiation of lessons for students is easier with technology. For example, on his web page he posts a variety of resources for his special needs students to review either in class or at their own pace. He also participates in staff Book Talks and is a member of the School Improvement Plan committee.

**Eileen.** Eileen is a female teacher who is in her 30th year of teaching and teaches sixth grade science. Eileen noted that she became a teacher as a result of her second grade teacher who was energetic, innovative, and a forward thinker. She is the mentor coordinator and contact person for new teachers at her school. In her 30 years of teaching she taught Kindergarten–

eighth grade in both a private and public schools. Eileen enjoys teaching science because she believes science touches our world every second of the day. Eileen loves when students are able to make connections to what they are learning inside and outside of school. As a result, Eileen feels rewarded when positive comments are made by students, parents and teachers about what the students learn in her class. However, Eileen considers herself a traditional teacher who has grown in integrating technology in her pedagogy. According to her, technology has made her teaching style more engaging, better organized, her lesson richer, and the pace faster, in comparison to earlier in her teaching career where she mostly used an overhead projector. Eileen noted that the students she taught prior to using technology got cheated because of the lack of technology in her instruction. The goals that drive her technology pedagogy are student engagement, mastery of objective, and state standardize testing scores. Additionally, Eileen believes that her learning style has improved since technology is visual. She also felt that her auditory skills have improved because technology allows her to listen to podcasts and books on compact disc or on her phone.

**Steven.** Steven is a male teacher who is in his 19th year of teaching. Steven attended college in the North where he earned both his undergraduate and graduate degrees. Steven noted that he wanted to become a teacher since he was in second grade. At that time, he thought that his second grade teacher got to do some of the coolest activities along with the fact that she used him as her assistant in class inspired him to become a teacher. Steven has taught in an inner city school, and suburban schools. When he taught in the elementary school, he taught Grades 1–5 all subjects and in the middle school he taught sixth grade mathematics and science, and presently he teaches seventh grade mathematics.

Steven's pedagogy goal is to help students grow and become more confident learners because he believes that all students can grow in their learning. He believes that teaching math and having a basic understanding of math is essential for students to achieve goals that they set. Steven runs a chess club at the middle school and holds math help sessions for students after school.

**Patricia.** Patricia is a female seventh grade science teacher who is in her 19th year of teaching. She began teaching 26 years ago but took 7 years off to stay at home with her children. She relocated from the Southeast where she noted that in her early teaching years, she did not have a lab table in her classroom. She indicated that as a result of not having furniture or the necessary materials she got creative and used any materials she could find to help students imagine and visualize in order for them to learn the curriculum. Because Patricia came from a poor rural area in the Southeast, it motivated her to do whatever she could to help students learn. Her philosophy about teaching is to use any tools that could help students become successful learners. She keeps an open mind as she continues to learn and grow as a teacher. Patricia claims that access to technology makes teaching a little easier for her. Patricia added that it saddens her that some schools have more than others which creates inequality in access to materials. Patricia mentioned that 15–20 years from now, the world will be technology driven, and her concern is whether every child have an equal opportunity to move into the technological age through proper preparation.

**Kaley.** Kaley is a female seventh grade language arts teacher who is in her 14th year of teaching. This includes 6 years at the middle school where the research study occurred. Kaley was born and raised in the South where she also attended college. Kaley claimed that she

became a teacher because her mother who was a teacher advised her that teaching was a solid, dependable career. Additionally, Kaley believed that she had the temperament, skill to reach, and connect and help students reach their full potential in life. Throughout her 14 years of teaching, Kaley taught middle school language arts and social studies. Kaley claimed that technology has allowed students to become more engaged in their learning process but cautioned that although technology is a great addition to her instructional practice, students foundational needs cannot be met using technology.

**Jack.** Jack is a male seventh grade social studies teacher with eight years of teaching experience. He has taught both high school and middle school students in suburban and rural areas. Jack became a social studies teacher because he loved history and wanted to share his passion for the subject with students. His pedagogy goals are driven by the idea that students will have a better understanding of the world if they can ask questions and if they can think for themselves and learn how to listen and respect other perspectives. Additionally, Jack believes that teaching social studies allows students to connect to the past, which can guide their future. Jack is a major advocate for educational technology and is always willing to volunteer to be a pilot teacher for any technological program in the district or at his school.

Jack grew up during the Internet age, but technology was not a part of his everyday life. Jack's students enjoy his class because they know that he uses a variety of learning tools to connect with students learning mode. Jack is the social studies department chair and represents the school at the school district monthly meetings.

**Ally.** Ally is a female eighth grade social studies teacher with eight years of teaching experience. Ally became a teacher as a result of her high school teacher's passion for teaching



and because of the encouragement he provided to her during her high school years.

Additionally, Ally believed that she could inspire and ignite a passion in her students about their academic studies. Ally has taught in an alternative school, high school and presently middle school. Her pedagogy is driven by the idea that she wants her students to become productive citizen so by teaching social studies, she helps them to understand history and how it molds their lives. In her school Ally helped to create and run a Mock Trial team and she also helps with the National Junior Honor Society.

**Tessa.** Tessa is a female eighth grade mathematics teacher who is in her 30th year of teaching. Tessa has taught both elementary school and middle school in suburban areas. Tessa noted that mathematics is everywhere; therefore, she integrates real world examples so that students can make connections to what they are learning. Tessa's pedagogy is driven by being able to connect, inspire and motivate students. She believes that students must be active learners which she encourages by recording her lessons for the school year so that students can access it at any time. By recording her lessons students can access them anytime to review anything they may have missed during the instructional lesson in class. Tessa believes, the recordings enhance students' learning and provides an extra support for students who need access to materials that they can review at their own pace and time. Students enjoy her classes as a result of this extra support because they can learn using technology which many students are comfortable using.

### **Research Methodology and Analysis**

In this qualitative single case research study, the data were generated from interviews, observations, and member checking interviews with nine participants. The research was guided by one question: How do teachers' experiences with technology provide an understanding

regarding their learning style and teaching style? I used the inductive analysis (see Appendix A) model to analyze the collected data from the first and second interviews and the observation, following the recommendations of Hatch (2002).

### **Data Collection**

I interviewed each participant twice to generate data for the study. For both interviews, I collected data in three ways. First, I conducted face-to-face interviews of the teacher participants and recorded their responses to the interview questions (see Appendix B). Second, I conducted observations of the teacher participants in their classroom using an observation checklist (see Appendix C). Third, I completed a member check with the teacher participants by returning the transcripts of the interviews. At that time, I reviewed their interviews with them to check accuracy. I also reviewed my observation with them, and then asked additional interview questions (see Appendix D) from Steven, Philip, Jack, Patricia, Ally, and Kaley. These six teachers made themselves available to answer the additional questions. The remaining three teachers were not available to answer the follow-up questions.

### **Interview Data**

In the first interview of the participants, I collected data from the teacher participants after school on a day decided upon between myself and the participants. I indicated to the teacher participants that the interview would be about an hour. During the interview session I asked each participant eight questions and I recorded responses to the questions asked in an audio file. I also jotted down notes as each participant responded to the questions asked during the interview. I summarized statements on my note pad made by each participant to help me

understand the data information provided for responses to the questions asked. This helped me understand the data and the information that was provided for the questions asked.

### **Observation Data**

I collected observation data from each teacher participant after they were interviewed. The observation took place during one of their 50-minute teaching periods and I observed for 50 minutes in the classroom. The goal of the observation was to understand technology use in the teacher participant setting or from the perspective of the teacher participant (see Hatch, 2002). Additionally, I had the opportunity to observe things that may have not been discussed during the interview, which matched expectations set by Hatch (2002). During the observation period of each teacher participant, I sat in the back of the class and recorded notes on my observation checklist (see Appendix C) to help me process and interpret what I observed. The checklist provided a methodical way to collect data for the research study.

### **Member Checking**

To accomplish member checking, I shared and discussed my interview transcript and observation notes with each teacher participant in a prearranged second interview meeting after school. During the member checking meetings, I discussed with each teacher participant these data from both the interviews and observations. My goal was to confirm the accuracy of data collected and to validate my observation in the classrooms of each teacher. The member checking meeting was used to triangulate the data that were collected. Triangulation is used by researchers to verify or add information given by the teacher participants in the research study (Hatch, 2002). It validates and supports the accuracy and interpretation of data collected (Stake, 1995).

## **Second Interview**

After conducting the first interview and analyzing the data, I developed more questions for the teacher participants. In the second interview, I interviewed six teacher participants and asked them four additional interview questions (see Appendices D and G). The teacher participants were Kaley and Philip (see Appendix G) who teach ELA, Steven who teaches mathematics, Ally and Jack who teach social studies, and Patricia who teaches science. These teachers were chosen because at least one of them taught English Language Arts, Mathematics, Science or Social Studies and they made themselves available to be interviewed. These second interview questions were created from the analysis of the first interview. This second set of questions encouraged elaboration and understanding of teacher participants point (Hatch, 2002) and provided additional data for this research study. The second set of questions were similar to the first set of questions but from a different angle using other words or phrases to probe deeper to answer the research question, per the recommendations of Hatch (2002). These responses were also recorded and transcribed.

## **Data Analysis**

Data analysis is a systematic way to gain an understanding of these data collected (Hatch, 2002). I used the inductive analysis steps (see Appendix A) to analyze the data collected from the participants. Inductive analysis provides a framework and guide to assist in discovering themes and relationships within these data collected (Hatch, 2002). Additionally, using this approach allowed me to gain an understanding of the data by beginning with specific information in order to find connections and patterns of meaning from the interview data collected (Hatch, 2002).

## **Interview Data**

For the first interview, I met with each participant and recorded each interview, then sent it to be transcribed by Rev.com which is a company that transcribes audio files. After receiving each transcribed interview, I emailed each participant a copy of their interview transcript so that they could check for accuracy of the information they provided. After the participants reviewed the transcript and indicated the information was accurate their data were ready to be analyzed. To conduct the analysis of these data, I utilized the inductive analysis (see Appendix A) framework for both the first and second interviews, per the recommendations of Hatch (2002). I first read and reread the transcribed data to gain a solid understanding of the information. I made notations about the data and then completed a short summary of each interview (see Appendix E) so that I could identify and establish the frames of analysis (see Hatch, 2002). These frames of analysis allowed me to focus on identifying specific words or parts of the data that is being analyzed (see Hatch, 2002). After establishing frames of analysis, I was able to organize and manage the data under each frame so that I could gain an understanding about the participants' experiences with technology.

The frames of reference are specific words, phrases or parts of the data that was examined. To establish the frame of analysis, I analyzed each teacher participant data from the first and second interviews using the inductive analysis model, per Hatch (2002). I first reviewed the collected data transcript and noted any new comments that I missed on the transcript sheet. I then summarized all the comments about teacher participants experience with technology on my note pad. Through this process I was able to group and separate comments that supported or did not support my research question and established six frames of analysis.

## **Identifying Frames of Analysis**

As a result of the interview transcription and review process, I was able to identify six frames of analysis. These frames are (a) understanding technology integration in school and teacher's pedagogy, (b) understanding teacher's challenges with technology, (c) understanding teacher's learning styles with technology, (d) understanding teacher's teaching style with technology, (e) identifying teacher's educational philosophy about technology, and (f) understanding how technology supports learners. These frames of analysis provided guidance and conditions for me to evaluate these data (see Hatch, 2002).

## **Code Creation**

I reread the collected data again to determine if there were new insights using the frames of analysis as my starting point. I looked closely for specific words or phrase such as comments, ideas, or similar quotes and placed them under one of the frames of analysis assigned them a code, per Hatch (2002). The frames of analysis helped to explain information within the data while the codes were used to describe concepts found within the data set. Codes are specific words or phrases that represents salient information from the data. These codes (see Appendix I) also provided a systematic way for me to develop categories, explore relationships and see patterns that were within the frames of analysis (see Hatch, 2002). In addition, the codes showed how teacher participants constructed their understanding about technology use and integrated it in their pedagogy (see Hatch, 2002). The codes were organized in a way to make unearthing of the information possible, therefore their structure included terms and cover terms which were linked by the semantic terms. Through this process I came up with 12 codes.

## **Identification of Codes**

I reviewed all the codes (see Appendix I) and determined which ones were necessary for my research and which were not (see Hatch, 2002). This was accomplished through analysis of all included terms and semantic relationships from the codes (see Appendix J). I kept in mind that Hatch (2002) suggested to carefully look at each code whether they had a small or large amount of included terms in each code. The information was used as a beginning mark to determine the codes which were necessary for the research study. I also made sure that the codes selected were pertinent to answering the research question.

## **Rereading and Refining Codes**

I read the data again and made notations of where all the codes were supported by the data but kept an open mind about the possibility of finding other codes that could be added (see Hatch, 2002). The codes that were assigned to the included terms were marked on my created data sheet. This strategy helped me to organize my record keeping of the information which was gathered from the data. In addition, this procedure helped me to look keenly at my data which helped to create a better understanding of the richness of the information each code provided (Hatch, 2002).

## **Checking that Codes are Supported by the Data**

At this stage, I determined that the quality of the data for the codes was elaborate while probing for data. However, I made sure that there was ample data to support each code so that when I reached saturation point it would be challenging to add new codes (see Appendix I). A point of saturation is difficult to achieve but I knew based on the recommendations of Hatch (2002) that if the data repeated itself, it would be an indication that the information is in the data

and I am close to reaching the point of saturation. In order to check if the codes reached saturation point, I reviewed the codes that were salient to my research question and searched for data that would be counter to the codes. Since none were found; I was able to validate that the data that was placed under the 12 codes were correct.

### **Complete Analysis Within Codes**

I reviewed these data and looked at the codes to find themes. These codes (see Appendix I) included the included terms, semantic relationships and cover terms (see Appendix J). I searched for links among the included terms, semantic relationships and cover terms because the links showed there were five themes across the 12 codes.

### **Search for Themes Across Codes**

At this stage the codes were reviewed to determine the connections among all the codes. This revision of data uncovered emerging themes (see Hatch, 2002). With all this information the broader focus was to understand what does all the information means? How does all the pieces of the data fit together? One strategy that was used to find the theme among the data was to search for similarities and differences and among the codes and complete an analysis of the codes, as recommended by Hatch (2002). Analyzing the codes can help researchers find positive relationships and to gather connection among the data to find overarching themes (Hatch, 2002). Putting all these data parts together allows researchers to determine how the data parts fit together so that themes can be determined (Hatch, 2002). It helped me to understand teacher participants' experiences with technology which helped me to write my findings.



## **Observation Data**

To analyze these collected observation data, I first reviewed each teacher participant observation checklist (see Appendix C). Then I summarized each teacher participant observation checklist information and typed a summary of each (see Appendix F). This summary created a clear picture of what took place during the observation class period of the teacher participant. Then I used the inductive analysis model (see Appendix A) to analyze the data. I followed the steps of the inductive analysis to help me understand the observation data and to find the themes and patterns in the data set. Each observation data was coded using the same code bank (see Appendix H) used for both interview data.

From both interviews data and observation data it showed emergent patterns and themes from the teacher participants' summary. To do this, I had to find the similarities and differences among the summaries. After using the inductive analysis steps (see Appendix A) to analyze both interviews and the observation data, my focus was to determine what the data analysis means and how it was pertinent to answering the central research study question.

## **Summary of the Findings**

The findings indicated that the teacher participants believed that their experience with technology had improved their learning style and teaching style. Several suggested that their use of technology kept them as active learners because they had to learn how to use it in order to integrate it into their pedagogy. In addition, some teacher participants had the opportunity to co-teach with another teacher who is knowledgeable about technology which added to their experience with technology. Although the teacher participants noted that their experience with

technology has improved their learning style those who were not comfortable with technology noted that they learned best and preferred a hard copy of materials rather than a digital copy.

As it regards to the teacher participants' teaching style, they reported that technology is a resource that facilitates their instruction and engages their students. They expressed that technology allows students to have access to more resources, it supports curricular goals which makes them more efficient. In their classes they used videos, podcast and various websites or apps to support student learning. Additionally, they indicated that technology allows them to connect with students using a medium that they are comfortable with. As a result, five themes and 12 codes emerged that supported the research question. These themes are *teaching with technology*, *learning with technology*, *technology as an exploration tool*, *technology as a hindrance* and *teacher's philosophy regarding technology*.

### **Presentation of Data and Results**

For this study, interview questions, observations, and member checking were used to analyze the data that was collected. I analyzed the data collected utilizing the inductive analysis steps, per the recommendations of Hatch (2002). The data and results of my analysis are presented here. Based on the analysis of the data five themes and 16 codes emerged. The themes and codes helped to interpret the meaning of the data.

#### **Theme 1: Teaching with Technology**

The participants explained that using technology to teach is an important tool to support curricular goals. Teacher participants also noted that technology is beneficial because students are more engaged, and it enhances their learning but more importantly technology enhances their instruction. Additionally, the teacher participants claimed that using technology encourages

them to learn more about technology so that they can use it consistently in the classroom. The following codes supported in explaining the theme: Teaching and instruction (TI), Language Needs (LN), Special Needs (SN), and Technology Resource (TR).

**Code TI: Technology and instruction.** The data collected through observation indicated that the participants used technology during their instruction. Some participants used it more often than others during their class period. In Tessa's classroom I observed technology being used for instruction and as a support resource for students. Tessa first used technology to model what the students will be learning during the class period and then the students were allowed to use the technology to access the information they needed. One of Tessa's practice is to record her math lesson and include notes and explanations for students to watch. Each recorded video is about 15 minutes and students have access to the video for the entire school year. During the interview, Tessa shared the following:

I think that in the 21st century using technology enhances what I do. I guess I am comfortable with technology because it seems natural. I would be less effective if you took technology from me. I think I would struggle with just the day to day interactions in the classroom and how you push things out and get things back. My main way of using technology is recording lessons. I teach eighth grade math, and I record this year in particular and years in the past, I've recorded every lesson with notes for the kids for them to watch. I try to keep the videos to less than 15 minutes for them to watch, where I explain and then they are able to go back and look at the videos anytime. I also use technology where students have to use ixl.com, which is a website that allows the kids to do practice. I assign them work and they use their devices to complete the ixl.com work.

I think that if the students came in and they weren't using IXL, or if I didn't have things posted on Google Classroom for them, or if they could not use technology, and it was just pen and paper, or pencil and paper we would be lost.

During his interview, Jack shared that using technology during instruction is important for him. I observed technology being used to reach all students in his class. Technology was used by English language learners and special needs students. This was done because Jack noted that technology can reach all academic needs. During the interview, Jack shared the following:

Technology can meet the academic needs of students, when applied correctly. If there is little to no follow up on the information students are learning, then that can create some gaps in learning. As long as there is a good mixture of tools used, then technology could reach every students' mode of learning while remembering that technology is a tool, it is a means to an end.

Steven noted that he has inconsistently included technology in his classroom instruction but knows that using technology can improve instruction. During his interview he explained:

The biggest obstacle I have with technology is the lack of knowledge. Fortunately, I work with younger teachers who are more knowledgeable about technology than I am and is willing to help me. With their help I can integrate some technology activities in my instruction. By doing this I can see the potential and effectiveness of technology in classroom instruction.

Steven explained his struggles with technology and noted that at times he felt overwhelmed with trying to include technology in his instructional practice. However, he noted that he often

receives help from teachers who are more technology proficient when he needs to include technology in his classroom lesson.

**Code LN: Language needs.** The participants were observed supporting students with language learning needs. The school provides iPads for language learners to use during the school day. These iPads come with a language translator application installed on them which allows the teacher and the student to communicate with each other. Using the iPads as a bridge between the student and teacher to communicate the teacher is able to assign some work in the student's native language. For example, in Patricia's science class the students had to read a handout which supported the unit that they were learning in class. The handout was through Discovery Education a digital online educational site that teachers use as a resource to teach. The handout that Patricia chose also had a Spanish translation version which enabled the student to participate in that activity. I also observed that Patricia monitored her language needs student to ensure that they were on task, and engaged in completing the work she assigned them. She monitored them closely because with technology it is easy for them to get off task and play games because they may feel overwhelmed with trying to learn a new language

During the interview, Patricia reported that her students' needs are very diverse. Some students have learning deficiencies, and some have language needs. Patricia shared the following about two of her students:

I have a student this year who only speak Romanian, I don't have anything in Romanian but since she also speaks Russian, she uses the Russian dictionary for translation. As a result, she is comfortable coming to me using Google Translate to communicate with me. My second student has only been in the country for 10 months. Google Translate does

not work for him because he and I cannot have private conversations because he does not know how to read Spanish. I can put information in the translation, and he can only listen to instruction because he cannot read his native Spanish language. I also have him watch video in Spanish and a few in English so that he can start learning the language. I am also teaching him letters because he has no formal education. I am happy to have technology as a tool to teach because he is not on grade level, so it has given me the opportunity to help both students with their language needs.

Ally explained that she uses Google Classroom in her instructional practice to assign students work. She noted that she uses various strategies to meet the need of her students through Google Classroom. She elaborated during her interview how she uses Google Classroom to meet students that have language needs:

A lot of times what I'll do for my ESL kids is that I will give them an easier version of what we are working on and then I will add a graphic organizer for them to work with what they have in Google Classroom. They may also have guiding questions to help them, but other students may not have these guiding questions. Again, it looks like they're doing the same thing as everyone else. They're on their own device but I have scaffolded down the work for them.

During his interview Jack explained that technology allows him to meet the needs of the students he teaches. He shared that students he teaches that has language needs can use technology to learn as they learn English. Jack noted:

Technology helps language needs students because I can provide individual instruction to these students which allows them to learn at their own pace. I can provide interactive

activities, visuals, auditory stimulus and other educational games to help these students learn while learning the language.

Eileen noted that technology have helped her reach her students especially her language learners. She explained that by using technology, she is able to communicate with them using a translation app on their iPad. She also assigned them work to meet their learning needs. During her interview, Eileen elaborated:

As a science teacher I can assign language learners videos to watch to help them understand a topic that is being covered. Discovery Ed provides videos and reading passages in both English and Spanish to help language learners. Additionally, if I need to communicate with a non-English speaking student, I communicate with them through an app on their iPad where we can type in questions and responses which is translated in their native language for them.

Eileen explained that technology is useful for overcoming language barriers between teacher and student, as well as providing curriculum in a student's native language.

**Code SN: Special needs.** The teacher participants were observed supporting students with special needs. Philip believed that technology is necessary when students work on some assignments independently. Philip, Tessa and Kaley noted that technology can help students with special needs meet academic expectations. During the interview, Philip shared the following about his special need students:

I have special needs students that are reluctant writers. When I allow them to use technology to complete their writing assignment, they get it done, it is completed faster, better and they are willing to take more academic risks. Higher access to technology

helps students with their spelling, grammar, sentence fragment and run-on sentence. This is helpful to students because the word processor on the computer will correct that for students.

Tessa explained that helping special needs students meet academic expectation is a motivating factor in her recording all the unit lesson she teaches for the year. She shared:

Recording all the unit lesson I teach enhances what I do as a teacher, but my special needs students can always go back and watch any lesson that they struggle with understanding at any time. These recorded videos provide the extra support that they need. Additionally, they can ask me questions that they may have when I work with them individually or in small groups.

During the interview, Kaley elaborated on how technology has been especially helpful for her special needs students. She stated:

I use a lot of visual reminders of directions for them to remember. Also typing is much easier for them than writing. I also use Quizlet to help them memorize vocabulary words.

**Code TR: Technology resource.** The teacher participants were observed using technology as a resource. Ally explained that technology is a good resource to support the curriculum. Technology allows Ally to create a student center environment where students encouraged to find their own answers instead of her standing before the class lecturing them.

During the interview, Ally shared the following:

During the year the students learn about the Vietnam War. We first discuss it in class and then the students research it using technology. By researching the Vietnam War students gain another perspective about the war. Having access to technology provides an



additional resource for students that supports the curriculum goals. Additionally, technology can tap into more learning styles so that students can use the learning style that is effective for them to learn.

Max and Steven also indicated that technology is a great resource although they struggle with integrating it consistently in their classroom instruction. During the interview, Max elaborated on this:

On the days I integrate technology in my instruction, students are more engaged in the lesson in that they are more attentive to me and what they are learning. When I use technology, I use it for math games, Kahoot, and many other math games. Another way I use technology as a resource is that I put my lessons on the SMART board and the students will complete their task on the laptop.

During the interview, Steven indicated that although he is not as knowledgeable as most of his colleagues about technology, he can see the potential as an effective resource in the classroom.

Steven elaborated by noting the following:

I have used technology for test and quizzes where I use a Google form to create the test. I type the questions and answer choices on the form. The students then click on the link I give them to access the test and complete the test. Once they have completed the test, they submit it and they can see immediately what their score is. It provides immediate feedback what they score on the test and they can see the questions they got wrong and right on the test. Sometimes I have set it up so that students can see a graph of how many of their classmates got each question correct on wrong. Using technology this way

makes correcting time simpler. The downside to this is that as the teacher I cannot see their mistakes on the test.

## **Theme 2: Learning with Technology**

The teacher participants explained that technology can be beneficial to learning. They stated that although it can support student learning, it has improved their visual and auditory learning as a teacher. Technology has provided interactive activities, both visual and auditory stimulus that teachers acknowledged has engaged them and has improved their learning. The following codes assisted in explaining this theme: Learning Style (LS), Information Access (IA), and Lack of Knowledge.

**Code LS: Learning style.** The teacher participants discussed their learning style and whether technology has helped or hindered their learning style. They reported that technology played a role in their learning style and several noted that they were visual learners, but other learning styles were evident with the use of technology. During the interview, Eileen shared the following:

My learning style is that I am visual, although the older I get I feel like I am getting more auditory. However, I think technology have helped my learning style since a lot of technology is visual. My auditory skills have also picked up because of technology by listening to podcasts and listening to books on CD or books on my phone. Technology can tap into several learning styles depending on what type of technology is being used.

During the interview, Max shared the following about his learning style:

I can learn by just listening and hearing a lecture. I like a book, a textbook, or a workbook. I like to write my notes in my notebook and review on my paper, so I am not

crazy about everything being online. If it is online, I need to print it and have it in my hands. I feel like I learn better that way. Doing a lot of work inside Google form online, especially math, I'm not a big fan of. I would rather paper, pencil, put the answers in a box or bubble a letter.

During the interview, Philip shared the following about how his learning style has been impacted with technology:

I think my learning style has been helped because I'm more willing to go further into something and investigate further than I probably was when I was in school because of how accessible information is through technology and also my own innate desire to learn more and find out more. On the other hand, I think technology can hinder my learning style because of the distractibility. I think when I am working on a task or working towards something, I'll often have multiple windows open, I'll click back and forth between things and break my focus.

**Code IA: Information access.** The teacher participants were observed modeling for students how to use technology as a tool to access information. Using technology is necessary because students may not have up-to-date textbook to help them access information. Kaley's student had to use technology to access information for a project they were working on. Before the students began working Kaley modeled how they should utilize technology to access their information. During the interview, Kaley stated:

The resources available on technology align directly with visual learning therefore it is important to model for students how they can access information for research or classwork. I am a visual learner, so I make sure that I have clear visual directions, notes

on PowerPoints and major ideas repeated several ways through videos, colors, repeated phrases and graphic organizers when modeling for students. In my classroom, I also use technology for review, and as a teaching tool. Additionally, I use technology for my own personal growth as a teacher to access articles and websites.

During the interview, Eileen noted that technology has provided opportunities for students to access information quickly and easily. Eileen shared how she uses technology to access information:

In my class, one way I use technology is to present information, and I have my students use technology to gather and learn information better. Using technology this way also allows my students to gain knowledge on a topic they are learning.

Jack shared that information access for some of his students can be a challenge he elaborated on this by indicating that:

Not every student has access to the same technology, or technology at all. I've seen where a handful of students have certain parental controls on their devices which keep them from completing certain activities or students may not have the internet at home. So, I provide technology for students who do not have their own device and provide time for them during the day for them to access the information they need to complete their assignments.

**Code LK: Lack of knowledge.** The teacher participants interviewed reported that there is a potential to be more effective as a teacher using technology but is not comfortable with technology. Both Steven and Max noted that professional development in technology with a focus on the subject they teach would be helpful for them. Kaley noted that she is sometimes

reluctant to integrate technology because it can become a big distraction for students. During the interview, Steven stated:

In my classroom, I've tried to integrate technology to make learning more efficient for students; but I have to admit I am not very comfortable integrating technology into my classroom. In addition, I really don't know a lot about the different technologies therefore for me to use it I have to be comfortable with it myself. As a result, it makes it very difficult for me to turn the students loose with it if I'm not sure how to work with technology or what to do if it doesn't work. When I have used technology in my class, I mostly use it for vocabulary review and now I try to use it for test and quizzes. As a result, I can definitely see where the potential is, to make me more effective, but like I said, I'm just not quite there yet.

During the interview, Max reported:

I am not as comfortable with technology as the students are. I'm not as knowledgeable about technology and I'm afraid that some of the students will abuse it and I won't be able to pick up on who's doing it and when they are doing it. On the other hand, I can see how technology when I have used it for a lesson, I am able to see how the use of technology can make me a more effective teacher. If I use technology, I mostly use it for online educational games or if I put a lesson on the Smart Board the students will complete their work using the laptop. I believe if the school had professional development in a teacher's subject area it would definitely help the teacher. It would help the teacher by showing them how to integrate technology in the subject area they teach using technology.

During the interview, Kaley noted:

My comfort level integrating technology is about 50%. I am oftentimes apprehensive to integrate technology if I know the students' mindset and level of maturity for the lesson that is being taught is not there. Additionally, I feel like I'm still at the basic level of understanding and utilizing technology. I oftentimes put their assignments and reading materials in Google Classroom for students to access, but I have not gotten to the point where I've had them do a lot of creating and implementing on their own. This is as a result of my lack of knowledge and my comfort level with trying to do more with technology.

### **Theme 3: Technology as an Exploration Tool**

The teacher participants explained that technology is an exploration tool. They reported that their use of technology at their school is a school wide goal that students are engaged with various technology tools to enhance their learning. They noted that they are encouraged to explore with technology and find ways to enhance the curriculum using technology. Through their exploration they could find ways to accomplish learning objectives or targets. The following codes assisted in explaining this theme: Collaboration (C), Technology (T) and Technology Experience (TE).

**Code C: Collaboration.** The teacher participant reported during their interview that collaboration was important as they integrate technology in their pedagogy. Eileen, Philip and Patricia noted that collaborating with colleagues weekly helps them as teachers share ways they integrate technology in their instruction. During the interview, Eileen reported:

I use technology to keep me more organized, and a big thing that helps with my pedagogy is with our professional learning team (PLT). We share a Google folder, and that helps because we can all look at items together at the same time and collaborate on things. This type of collaboration makes a big difference because we can share Google documents or Google slides with each other. Collaborating likes this makes me a better teacher and helps me to improve my instruction.

During the interview, Philip elaborated:

At times we as teachers and members of our learning team will collaborate to find ways that we can use the technology, if that means greater engagement or accessibility of information.

Patricia also explained:

It is good to collaborate with other teachers to understand how they implement technology in their instruction. Every week we collaborate within our learning teams. One of the things we talk about is how we can incorporate technology more in the classrooms. Since school has invested heavily in technology and it's a district vision, we share with each other ways we implement technology in the classroom.

**Code T: Technology.** During the interview, it was evident that there was a variety of experience with technology among the teacher participants. They reported that technology is a great tool to have access to and like the fact that their school has invested in technology. Kaley explained:

I feel that technology use in the classroom can prepare students for the future and it should be used to make learning purposeful, interesting and engaging. Technology is an

integral part of the learning process and so I am committed to using technology in the classroom. Using technology makes me more aware and more open to making sure I do engaging and purposeful activities and lessons, when I integrate in my instruction. I have mainly incorporated technology through Google Classroom where I have students' access reading materials and text online. I have incorporated writing assignments online so that I can give students more immediate and timely feedback.

Kaley further explained how technology has helped both her learning style and teaching style:

Technology has helped my learning style by making resources and tools more accessible to me. I'm able to review things quicker, and I'm able to keep up with the current 21st century learning materials. It has helped my teaching style because students get excited when they do something online or when they submit something online because they know they are going to get immediate feedback. This helps me to gear my teaching according to how students on a particular assessment which helps me to be more efficient as a teacher.

Tessa elaborated about technology:

Technology has helped to enhance the curriculum and not drive the curriculum. My school has provided the devices and the internet which allows teachers to take chances. As a teacher I believe if you took technology away from me, I would become less effective as a teacher. I believe that if a teacher is not using technology in the 21st century. They would be cheating their students.

Jack explained:



Technology has provided a rich amount of resources at hand to improve students learning. Using technology as a means of understanding a topic and or creating a product can show a student learning. People sometime assume that technology is just for researching information on the internet, but it is more than that. Technology can help others learn through the use of interactive games, visuals, auditory stimulus and educational games that can engage learners.

**Code TE: Technology experience.** During my interview with the teacher participants it was noted that a teacher participants' experience with technology resulted in how much technology is integrated in their pedagogy. All teacher participants were interested in continuing to grow and learn about technology so that they can continue to integrate it in their instructional practice. Tessa, Ally, Eileen, Patricia, Jack who were more experience and more knowledgeable about technology integrated technology consistently in their instruction while Kaley, Max and Steven who were less experienced integration in their instruction were very limited. During his interview Jack remarked:

I am a major advocate for educational technology. Students are living in a digital world and want to be connected at all times. So, providing a learning experience using technology is important to me and it is also a fun way to learn history. With access to iPads, laptop carts, smartboards and BYOD it has made it easier to integrate technology in my instructional practice

During his interview, Steven noted that:

I really don't know a lot of different technologies. For me to use it, I have to be comfortable with it myself. That makes it very difficult for me to turn the kids loose with it if I'm not sure if it will work, or what to do if it doesn't work.

#### **Theme 4: Technology as a Hindrance**

The participants explained that although technology is a great tool to have to support learning it can also be a hindrance. It can be a hindrance because of the distraction of having multiple windows open at the same time. Having multiple windows open becomes a hindrance because it can affect both teacher and students focus by trying to look at various information simultaneously. Additionally, if the use of technology does not meet the learning and academic goals then it can become a hindrance to learning. The following codes assisted in explaining this theme: Applicable Use (AU) and Teacher Belief (TB).

**Code AU: Applicable use.** During my interview with the teacher participants' they reported that technology integration in a classroom lesson has to be applicable to what the students are learning. This means that when a teacher integrates technology in their instruction it must be with a purpose and not just to check a box to indicate that they have used technology in their classroom. They should ensure that the use of technology supports the learning goals and students understand the learning goal and why they are using the technology otherwise it can become a hindrance to learning. During his interview Philip remarked:

I think it's important for students to be able to use and collaborate with technology so that they understand the purpose and value of it. However, I think technology hinders them in the sense that when I am teaching something that's basic pen and paper I know where my students are at. I think that when students are doing something with technology I may

not know where the gaps and holes are, and where they need support and they are less noticeable when they are really struggling.

Kaley noted:

Technology can help students meet their learning goal. Since I am about 50% comfortable with integrating technology in my instruction, when I use it in my instruction, I make sure that it is applicable to completing the task at hand. For example, when students had to work on an infographic assignment, students had to learn how to use the technology to organize and research the information.

Jack also explained:

Technology is a great tool to reach all learning styles. However, there must be a balance and the use has to be intentional so that there is no overstimulation if technology is used too much in the classroom.

**Code TB: Teacher belief.** During my interview with the teacher participants' they reported that as good as technology is it can be a hindrance to student learning if not implemented properly. Jack noted that it can hinder students because they can click open other tabs which gets them off task, therefore teachers must closely monitor technology use in the classroom. However, the teacher participants believed that any tool that can support student learning must be implemented in their pedagogy to give students a chance at academic success.

The following code assisted in explaining this theme: Teacher Belief (TB). During the interview, Jack commented:

Technology can hinder learning because one can easily click open a new tab or app and get off task. Also, if the internet goes down activities can be delayed or not completed.

Technology can also hinder learning for kinesthetic learners because there is a lot of sedentary activity involved with technology activities. Although it can hinder the learning process it can help others learn by providing interactive activities, visuals, auditory stimulus and or educational games that can hold a student's attention.

During the interview, Eileen noted:

When I first started teaching, I had a computer, but I didn't have a projector to project anything. In fact, we just had overheads and I often cringe at the thought at the thought at how those students got cheated as compared as compared to the students I teach now. I feel with the integration of technology in the classroom my lessons are richer, and students are more engaged with the technology that I now use.

Max commented:

There is definitely a place for technology in the classroom. Students must be exposed to technology because in the real world they will need technology skills. However, in order to implement it effectively, teachers must be trained so that they can feel comfortable with it.

### **Theme 5: Teacher Philosophy Regarding Technology**

The teacher participants explained that technology should be an integral part of learning in the 21st century. Their philosophy was that any tool that will help students become successful should be integrated in the learning process. Patricia noted that "we should keep an open mind and be willing to experiment" will help to move students forward. During the interview, Eileen commented that:

We should be using technology in our pedagogy otherwise we will be cheating our students if we are not. I feel like we will be able to move students forward if we have conversations with each other about strategies we use for various activities we use technology for.

During the interview, Tessa mentioned:

My philosophy is to use any tool that's going to help students be successful. I think technology should be a part of learning. I don't know how you can teach without some form of technology. There should be technology integration in a teacher's pedagogy. I think we need to take a step back and see where we are letting technology lead us but at the same time I think you're doing a disservice to the students if you are not integrating some sort of technology in what you are doing in the classroom.”

During the interview, Philip commented:

If technology can create a better end result in quality for the students, then I'm interested in using it. If it will make some activity more accessible for students, we should use it so that students can continue to improve their learning.

#### **Chapter 4 Summary**

In this chapter I detailed the purpose of the study and the research question. This chapter included a narrative description of the sample, and of the process that was used in collecting, and analyzing the data step by step using the inductive analysis. A summary of the research study findings was explained with the presentation of the data results. The data was gathered from interviews, observations and member checking. From the data, themes and codes resulted and

was used to summarize the findings. In Chapter 5, I will include a discussion and interpretation of the findings to conclude the results about the research study.

## **Chapter 5: Discussion and Conclusion**

The purpose of this chapter is to present and discuss the findings of this qualitative research case study. The discussion will focus on the interpretation of the data, the study's relationship to the literature, and the limitations of the research. Additionally, there will be a discussion about the implication of the findings as they pertain to practice, policy, and theory, along with recommendations for further research.

Technology drives what it means to be knowledgeable and prepared to live and work in the 21st century that demands more and more focus with the use of technology. As the use of digital technology continues to grow, teachers are encouraged to integrate technology in their instructional practice. One significant aspect society should take into realization is that some teachers may not have received technology training during their preparation years to become a teacher (Chicu, 2018). Presently, traditional methods in teaching appear to be insufficient to enhance students' learning needs; therefore, technology is viewed as an alternative approach to improve student learning in the classroom (Yildirim & Sensoy, 2018). Some teachers still maintain traditional methods such as passive learning, and memorization which is learning of the past. To prepare students to embrace 21st century thinking students must be able to think critically, problem solve and be innovative (O'Neal et al., 2017). The skills necessary in the 21st century will be important because the jobs that will be available in the workforce will require technology skills.

There is a divide between the educational society and the technology world within which students have grown up (O'Neal et al., 2017) School curriculums do not necessarily prepare students to meet the technological world (O'Neal et al., 2017). Therefore, if teachers want to

effectively prepare their students to meet future expectation technology must be integrated in the classroom. However, with additional support of technology in the learning environment, student engagement and attitude towards learning could improve, especially for students who struggle academically (Yildirim & Sensoy, 2018). To provide an effective, rich learning technology environment, teachers should have technology experience. Although some teachers include technology to enhance students learning while some use it for administrative activities there still are challenges for teachers to design a technology rich classroom (O'Neal et al., 2017). This challenge stifles their capability to nurture and establish a 21st century learning environment (O'Neal et al., 2017). As a result, this research case study used an inductive approach to gain an understanding about a teacher's technology experience and the role it plays in their learning style and teaching style.

### **Summary of the Results**

The research study was guided by the research question: How do teachers' experiences with technology provide an understanding regarding their learning and teaching styles? The data collected from interviews, observation and member checking from the sample of teacher participants in this study were used to answer the question about how teachers experience with technology provided an understanding about their learning and teaching style. These results suggested that both experience with technology and use of technology in instructional practice were influenced by the learning and teaching styles of the teacher participants. The more experienced a teacher was with using technology, the more they used it in their instructional practice because they believed technology supported their curricular goals.



The teacher participants who were less experienced with technology integrated technology inconsistently in their classroom instruction. These teacher participants' lack of experience and lack of knowledge made them uncomfortable using technology in their instructional practice; therefore, the use of technology was very limited in the teachers' instructional practice. These teachers believed that they could be just as effective using paper and pencil in classroom instructions. However, the less experienced teachers explained that when they used technology, it increased student engagement and excitement among the students about the topic they would be learning for the day. As a result, they believed that the use of technology could be beneficial in their pedagogy and noted that if they received technology professional development in the subject area they taught it would be helpful. This finding supports existing literature which states that teachers may need ongoing support to help them integrate technology consistently and effectively in their pedagogy. Furthermore, the successful implementation of technology in the classroom is a result of the teachers' experience with technology and their learning prior to becoming a teacher.

### **Discussion of the Results**

The research question for this study was: How do teachers' experience with technology provide an understanding regarding their learning and teaching styles? The teacher participants explained that their experience with technology had improved their learning style, teaching style, or both. Those teachers who were less experienced with technology indicated that technology had not improved their learning style but kept them as active learners. These less experienced teacher participants noted that they preferred a hard copy of materials rather than a digital copy to aid learning. Furthermore, the less experienced teacher participants believed that technology

increased student engagement and interest about learning. They noted that students become more focused in achieving the learning goals for the class period and the classroom environment becomes more student-centered than teacher centered. Although they recognized that there are benefits to technology use in the classroom, they explained that their lack of confidence, knowledge, and experience with technology caused them some concern.

The teachers further explained that sometimes when they plan a technology lesson, they experience a loss of internet connection or the software they planned to use does not load. This problem they noted causes them to lose valuable teaching time. They felt these problems justified their belief that they can be just as effective without teaching with technology in the classroom. As a result of some of the technical problems or difficulty with trying to integrate technology in their pedagogy, these less experienced teachers expressed an interest in receiving technology professional development in the subject that they teach.

The teachers who were more technologically competent also experienced technology issues. Although they may have had the same technical issues with technology, they noted that the benefits of teaching with technology outweighed any computer issues they may experience. They indicated that the use of technology in their teaching practice gave them the opportunity to try new digital devices to advance student learning. They were also willing to trouble shoot technology issues and collaborate with other teachers to try and solve technology problems.

The theme *teachers' philosophy about technology* (Theme 5) emerged because the teacher participants believed that technology can be an integral part of 21st century learning. Teachers believed that technology should be used to support both student-centered and traditional teaching activities in their daily pedagogy (Li, Garza, Keicher and Popov, 2018).

Several teachers stated that the use of digital technology provides accessibility, strengthen the quality of opportunity for students and prepare them for the future. They further noted that they are willing to try tools that will help students to be successful and since the focus in education is integrating technology into their instruction; they are willing to learn and explore with these tools. Several teachers explained that if integrating technology in their pedagogy can create a better result in quality for students then technology must be used in the classroom lesson.

Technology they noted make some activities more accessible to students, such as a variety of text levels, a variety of visual and text base activities or word processing. If access to these devices provides a better learning outcome for students, then technology must be a part of every teacher's instructional practice many teachers noted.

Many of the teachers noted that their philosophy about technology determines when they should or should not use technology in their classrooms. They noted that technology must be integrated with fidelity making sure that students understand the expectations, purpose and goals when technology is integrated in the classroom lesson. Additionally, students must understand what their learning outcome should be when they use it in the classroom.

Overall, the teachers' philosophy was that any tool that will help students to be successful must be used (Li et al., 2018). Teachers expressed a need to have an open mind and experiment with technology as they keep students engaged and as active learners so that they can have positive learning experiences in school. The teachers further explained that if teachers are not using technology in their classrooms, they are cheating their students out of a positive learning experience. Additionally, they explained that teachers who struggle with technology integration should find other teachers willing to work with them as a team.

The theme *learning with technology* (Theme 2) demonstrated that teachers believed that technology is beneficial and a great resource to use because technology has kept them as active learners. For teachers to learn and implement technology they explained that they need technology professional development. These professional developments must be ongoing, meaningful and essential for their pedagogy (Ciampa, 2017). The results demonstrated that teacher participants' who used technology in their instructions, must have some knowledge about technology when they included it in their pedagogy. As they continue to strengthen their knowledge teachers must have access to mentors or peers to help them integrate what they learn about technology in their classroom (Ciampa, 2017). The participants believed that by using technology their visual and auditory learning style improved. They explained that a lot of technology is visual but is also auditory as a result of listening to podcast. According to the participants, as the students learn with technology they also learn because they have to be knowledgeable about the activities they assign their students when technology is included in their instructional practice. The use of technology to learn indicates that teachers access multiple resources to increase student engagement which may support their learning style. Teachers noted that using a Smart Board which can be used for interactive learning activities has helped to make learning more engaging for students.

Several teachers noted that students should be learning consistently with technology. They explained that for this to occur it will be necessary for students to have access to technology daily. Most students have cellphones which allows them to access the internet for information. With this type of access teachers would render a disservice to students if they do not integrate technology in their daily pedagogy for students. Many teachers noted that they can take

virtual trips with their class as a result of technology. Technology has allowed them to create a student-centered environment where students are driven to find their own answer through virtual learning trips. Using technology to teach has allowed teachers to move away from classroom lecturing style and make teaching more student-centered, and interactive.

For example, some teachers noted that Google Classroom was not available early in their teaching career. However, as a result of Google Classroom being available teachers can post a variety of resources for students to access, students can then submit their work using Google Classroom. They noted that this access to information speeds up the learning process. Another benefit of Google Classroom indicated by teacher participants is that they can post assignment with a rubric for students to complete. The assignment can be graded online and the teacher also provides immediate feedback for students to access.

Teachers described other ways they used technology to teach is by providing supplemental lessons as resource for students to access whenever they need to. In addition, they use technology to present information in a more engaging way to enhance student learning. By utilizing technology as an additional teaching resource several teachers noted that their teaching style and learning style has improved, and their students are more engaged in their learning.

The theme *technology as an exploration tool* (Theme 3) showed that using technology allowed teacher participants instruction to be much deeper and richer for the students (Rose, Habgood, & Jay, 2017). This occurs because teachers can explore with various learning tools. The teacher participants used for this research study explained that their school wanted teachers to explore and integrate technology in their pedagogy. To do this the school has provided laptops and iPads for each teaching team, each teacher in the school has 10 additional laptops

computers in their classrooms, and students can use their own device because the school has BYOD (Bring Your Own Device). Additionally, the school provided technology professional development for teachers which could be helpful for teachers who lack knowledge about technology.

As technology is viewed as an integral part of the classroom instruction teachers who struggle with technology integration are encouraged to explore with the students so that they can gain technology experience. If teachers are not willing to explore with technology their learning and teaching may not improve. Some teachers who have been teaching before technology became an integral part of classroom instructed noted that they had to practice and explore more with technology than their younger teachers. For example, teachers' can explore with technology and use it to enhance students' mastery in their computational ability and other technology activities (Rose, Habgood, & Jay, 2017). This exploration was helpful especially when they had to introduce new apps or websites, they wanted their students to use. For example, the App Pear Deck is one that some teachers may not be accustomed to or never heard about, but in order to use it in the classroom the teacher had to be comfortable with it. Some teachers who may be technology savvy would know how to use it without a problem. However, those who are not technologically savvy would have to explore by watching videos and practicing with the App to understand the intricate details about how the App works and how it can support the task student may have to complete. Teachers also encourage their students to explore as they learn with technology. This exploration with technology is important because students are always learning about activities that can be accomplished with their technology.

Within the theme *teaching with technology* (Theme 1), the findings reinforced that teachers believed that technology is a beneficial resource for them to include in their instruction. Many classrooms throughout the USA teachers' have added blended learning using technology in their instructional practice for both traditional and online instructions (Lieser, Taff, & Murphy-Hagan, 2018). Teachers integrate technology to meet their professional needs and their students learning needs. The teacher participants explained that teaching with technology benefitted the quality of their lessons because they have access to more resources for students. For example, the teacher participants noted that they can differentiate reading assignments according to students reading level by posting a leveled copy of the reading passage the class is reading. It's noted that they can post assignments with a rubric attached for students in Google Classroom and provide immediate feedback for students once the assignment is completed. Blended learning using technology to teach can meet learning needs, support collaboration between teacher and student and enhance student-centered pedagogy (Lieser et. al., 2018).

Another teacher explained how she records videos of all her lessons that she will be teaching for the year. During class she might pull a small group to work with while another group watches a lesson she is teaching. This type of teaching and learning with technology allows students to be on different units and levels in their learning process and learn at their own pace. These results demonstrated that many teachers believe that technology should be a part of their teaching tool because it provides students access to the content students is learning. Additionally, it supports the needs of students wherever they are in their learning process and allows teachers to reach and help more students.

Another aspect of teaching with technology is that it can help special needs students and English Language Learners. For example, one teacher noted that it is easier to communicate with a student who does not speak English. The student carries around an iPad that has Google translate App on it. Using the translation App allows the teacher to communicate with their non-English speaking students throughout the day. Students whose native language is not English can also watch some videos using the translation App and participate in class activities that can be translated into their native language. It also provides opportunities for other students to interact with them either through collaboration in group activities or just daily communication between them.

Another benefit that teachers who teach Special Education students explained is that technology can provide differentiation of instructions for these students. The teachers noted that if these students must work independently, they should have higher access to word processors. For example, students with penmanship issues will have the opportunity to type their assignments. The teachers noted that when their students can type their work it gets done faster and better and their students are willing to take more academic risks. The word processors can help students to use predictive text to help them with spelling. It will also help students identify grammatical errors, sentence fragments or run on sentences. Having a device that can perform grammar check or spell check has been helpful to special education students. Another way technology is used to enhance their learning is the use of headphones that are provided when students watch videos and Power Points independently that aligns with what they are learning. Additionally, if students must read a handout the computer can read it to the student while they



follow along. These features that technology provides help teachers to meet the needs of all the students in their classroom.

The theme *technology as a hindrance* (Theme 4) emerged because some teacher participants explained that integrating technology in their instruction can be problematic. The results showed that the teacher participants who were the least experienced with technology found technology as a hindrance. They stated that they were overwhelmed with it, did not have the time to try new things, and needed more technology professional development in the specific subject they taught. As a result of their lack of technology training and knowledge on how to integrate technology or the software for their classroom instructions teachers sometimes view technology as a hindrance (Khodabandelou, That, Selvaraju, Ken, Kewen, Yan & Ning, 2016). They noted that sometimes they have used technology to indicate that they have used technology in their classroom which is not always beneficial to students.

Another hindrance that several teachers alluded to was that preparing lesson to integrate technology can be time consuming. They explained that trying to plan lesson to satisfy the need to integrate technology can be overwhelming because there is a vast amount of information that technology provides that they must choose from. Trying to decide what information is beneficial to the lesson or the digital resources can be time consuming and overwhelming and a hindrance challenging for some teachers (Ekberg & Gao, 2018).

Another hindrance that several teachers noted was that sometimes the technology devices or the internet is does not work. They explain that this can be a hindrance especially if their lesson for the class period was planned with the idea that the technology will be available for them to use. When this happens the activity that was planned for the lesson would be delayed or

not completed at all. Other hindrances that occur is with students who may have problem accessing the internet with their identification code. This can be challenging if the assigned activity is to be completed independently.

In addition, to the aforementioned technology can hinder learning because it is easy to click and open a new tab or app and get off task. This becomes a big distraction for students because there are many off task activities that can be completed with technology which hinders student learning. Kinesthetic learners can be hindered by technology integration into their instruction because technology provides a number of sedentary activities because students are not moving around. Many teachers who struggle with technology indicated that they can be effective as a teacher with paper and pencil. The teachers explained that technology cannot meet students' foundational needs therefore it can hinder them because it may not fill in students' gap in their learning process.

In summary, the teacher participant for this research study demonstrated that their experience with technology could provide insight into their learning style and teaching style. The teachers believed that technology should be an integral part of 21st century learning because it is a good resource for teaching and learning in the classroom. As a result of the interviews and through observations I learned that teachers who were more experienced with technology used it often in their instructional practice. These teacher participants facilitated technology often in their instruction because it increases student engagement and eagerness about what they are learning, and it allows teachers to meet the needs of their students. Those teachers who were less experienced with technology found that integrating technology in their instruction was time

consuming, and at times found it challenging to in their instruction. They believed that they could accomplish their instruction successfully using paper and pencil.

As far as their learning style the study revealed that the teacher participants who were more experienced using technology believe that their visual and auditory learning style improved with technology. They believed that since most of the technology used in school is visual it has helped them. The teachers who had the least amount of experience with technology believed that their learning style had not improved because they are not comfortable with technology. They preferred a hard copy of materials instead of a digital copy along with a preference of using paper and pencil to learn instead of using technology. It is believed that the way teachers deal their learning or with student learning influences their academic success (Jepsen, Varhegyi & Teo, 2015).

### **Discussion of the Results in Relation to the Literature**

The possibility for the integration of technology to restructure education has been viewed as a part of 21st century learning. Technology is changing economies, culture and societies throughout the world (Shaffer et al., 2015). Many educators believe that incorporating technology into classroom pedagogy is essential for students to acquire the skills they need to be prepared for the future workforce (Yu & Okojie, 2017). The investment of technology hardware and software by schools was done with the belief that teachers would implement it in their instructional practice. The school where the teacher participant sample worked demonstrated that teachers experience with technology range from very limited experience to very experienced. Some of the teachers from the sample explained that they faced external barriers with technology integration (O'Neal et al., 2017). The teachers explained that they lacked

professional development in technology and there are instances where their curriculum does not provide opportunities for them to use technology. Some teachers who were moderately proficient in technology explained that their curriculum have been a barrier to using technology consistently (Greenhow & Askari, 2017). These barriers have prevented them from gaining the experience they need to effectively integrate technology in the classroom because their curriculum does not have areas where technology could be integrated.

Previous research noted that technology provides a rich learning environment where technology is a part of daily instruction, but it did not always match the teachers' teaching style (Ruggiero & Mong, 2015). This was especially challenging for teachers who had difficulty integrating technology consistently in their classroom instruction. The teacher participants who were not technology proficient noted that their school had no systematic way that they used to infuse technology in the school culture (Schrum & Glassett, 2006) therefore the integration of technology in their pedagogy is left up to the teachers. Without clear cut guidelines teachers who lacked technology skills struggled with teaching with technology. However, these teacher participants explained that whenever technology is integrated into their instructional practice students' engagement and interest in learning increased to meet the learning objective. This engagement occurs when the teacher participants utilized technology in authentic learning classrooms instruction which in turn increases student enthusiasm in their learning environment (Mitchell et al., 2016).

Teachers have become increasingly aware that just using textbooks to teach is no longer an effective way to deliver classroom instruction in a technological society (Mitchell et al., 2016). When classrooms are teacher-centered and only textbooks are used to teach students

thinking and academic progress is hindered (Du, 2018) therefore teachers have to infuse other teaching methods to meet the needs of students. Teachers are expected to implement various learning strategies because they are considered the foundation for improving teaching quality and executing the curriculum that students must learn (Du, 2018). As educational reform continues to grow constructivist principles continue to be the driving factor (Aydogdu & Selanik-Ay, 2016). While some teachers have embraced changes, others have held on to their inherent beliefs about teaching style and learning styles which has impacted them embracing new instructional pedagogy (Aydogdu & Selanik-Ay, 2016).

Although some teachers have held onto their beliefs the participants explained that it is vital for students to include technology in their learning process as a result of emphasis being placed on students having knowledge about technology. This is essential because the school where the teacher participant sample was taken from has an abundance of technology. This is because there is an expectation that teachers will be willing to explore with technology because it can be instrumental in improving reading, mathematics and other intellectual skills (O'Neal et al., 2017). Schools like the one where the teacher participant work has invested heavily into technology and continues to do so for the students. However, the teacher participants recognize that for them to successfully integrate technology in the instructional practice they must be proficient in computer literacy (Yu & Okojie, 2017). As a result, it is essential that teachers develop computer knowledge and the ability to implement technology to improve student learning (Krause, 2017).

Several teachers from the sample preferred paper and pencil and believed their learning style has not improved with technology. However, for teachers to gain experience with

technology teachers must be willing to become proficient in technology integration by demonstrating a desire to learn about technology so that they can incorporate it consistently in the classroom. Teachers who prefer paper and pencil must recognize that years ago teaching may have been possible without technology integration however in classroom today it is necessary (Chicu, 2018). Teachers must acknowledge that students use technology and applications daily therefore it is important for them to teach using what students embrace. Using technology can improve the effectiveness and level of learning strategies and instruction (Chicu, 2018).

The teacher participants who had limited technology experience explained that technology is time consuming and a distraction to students. However, self-efficacy toward the integration of technology could influence their beliefs, knowledge, experience and skills about their ability to effectively implement technology in their pedagogy (Krause, 2017). These teachers must be intentional in their efforts to improve technology opportunities by planning instruction that allow them to teach using technology while increasing their knowledge and experience with technology (Efe, 2011). To promote technology opportunities for students necessary for 21st century teaching and learning teachers explained that they need professional development on how to use technology to help students construct their own learning (Ertmer & Ottenbreit-Leftwich, 2010). This would be helpful for teachers because technology can be beneficial for teachers' instruction practice in that it helps them learn new methods of delivering content to students (Ertmer & Ottenbreit-Leftwich, 2010). With schools expecting teacher to use technology to strengthen their instruction to reach students, limited use of technology will not be enough to meet the needs of students. As a result, if teachers experience is limited then it will

affect their teaching style and teachers will continue to teach according to how they learn.

Teachers explained that professional development in their subject can help them overcome these challenges.

Teaching experience is paramount to teachers' beliefs when teaching with technology in classroom instruction (Al-Awidi & Alghazo, 2012). Schools have made efforts to establish and encourage technological innovations in the classrooms (Hosman & Cvetanoska, 2013) but while some teachers are comfortable integration technology in their instruction some are still uncomfortable with it. Self-efficacy about technology determines how teacher participants interact with technology and use it in their instruction. The goals of schools with technology are to promote the growth of students 21st century competence for college and the future workforce (Wang et al., 2014). To meet these goal teachers who lack technology experience will have a difficult time trying to integrate it in their instruction and their teaching style will be affected by their lack of experience. If they teach using only paper and pencil because that is how they learned best and believe that is the best way for their students to learn, students may be at a disadvantage.

However, the delivery of knowledge is changing in education along with the changing roles of teachers in a technological society forces teacher to acquire the skills and knowledge needed to prepare students for the future (Shaffer et al., 2015). For example, hardcopy of worksheets provided by teachers are moving towards changing to digital workbooks. These workbooks make it simpler for both students and teachers to retrieve when they are ready to use them. For these digital workbooks to be utilized properly in the classroom, teachers must be technology proficient and knowledgeable about using technology in this way.

The results of the research study indicated that teachers must be prepared for their classrooms to be transformed in a way that the use of technology is evident. To accomplish this teachers' who are not experienced with technology should receive more professional development and mentoring to help them make that transition (Shaffer et al., 2015). Secondly, teachers create their lesson plans, activities and other assignments for their students, assistance should be provided for inexperienced technology teachers to link their lesson plans to include a technology component (Shaffer et al., 2015). Additionally, teachers should learn and practice with the same technology that their students will use in the classroom (Shaffer et al., 2015). With these technological shifts, teachers will need continuous support as they transform their classroom into a technology rich learning environment.

### **Limitations**

This study was limited because the teacher participants sample was taken using a small group of teachers from one middle school. The sample did not represent several middle school teaching populations. The data gathered was limited to only those teacher participants' experiences and beliefs therefore one should be careful with making general statements using the results of the research. To justify the results future researchers should use a broader sample from various middle schools.

Secondly, I used the inductive analysis method as described by Hatch (2002) to answer the research question which was adequate for this research study. Other methods could have been used to support or question the results from the study. The study was guided but limited to specific questions, therefore subconsciously my analysis and interpretations of the data could have been influenced by my experience or knowledge. Prior to interviewing the participants,



they knew what the interview would be about. Knowing this could have guided their responses during the interview; therefore, the accuracy of their responses could have been guided by their inclination to respond truthfully. Additionally, their responses may or may not demonstrate their true use of technology in their classrooms.

While this research study may add relevant information to the study of understanding teachers experience with technology and its link to their learning and teaching style it was limited in scope. The limited scope included middle school teachers from one school who taught Grades 6–8 and the study was one examination of a phenomena in a single educational environment. If this study was to be replicated using a qualitative approach it would not be easily replicated. This is a limitation for qualitative study because the findings are dependent on the interpretation of the researcher as a result of there being no set guidelines as to how to conduct the same study and get the same findings (Eyisi, 2016). If this is replicated another researcher may give a different interpretation whereas in a quantitative study the findings are measurable as a result of numbers being used (Eyisi, 2016).

Researchers in a quantitative study generally do not have a close relationship with participants in their study which helps to eliminate the idea of them being bias. The question of a researcher being bias can be excluded when researchers do not have interactions with the participants in their study. The question of researcher's bias can be eliminated when researchers collect their data using questionnaires, internet, phone interviews and other not direct interaction (Eyisi, 2016). If there is direct contact between participants and researchers it provides a way for sample participants to structure the study (Eyisi, 2016).

## **Implication of the Results for Practice, Policy, and Theory**

The study presented implications about teachers experience with technology and its integration in their pedagogy. The results from the research study align with constructivism about teacher participants' personal experience.

### **Practice**

To have a successful and effective integration of technology in classroom instruction teachers' experience and readiness is necessary for this to occur (Kim & Kim, 2017). For this to take place barriers that impede teachers from implementing technology in their classrooms must be removed. Teachers contend that students' engagement and interest increase when technology is a part of their learning. Integrating technology in a teacher's practice is vital because technology is part of our daily interaction in society. For example, it is used for everyday communication, sharing information, and several skills today require technology experience (Thoma et al., 2017). Although there are benefits to teaching using technology, technology integration is occurring inconsistently or is being implemented in a superficial way (Thoma et al., 2017). Many schools like the one where the teacher participants came from has Professional Learning Teams (PLT).

In these Professional Learning Teams training should be provided for teachers as to how to use technology to support their instruction. By incorporating training for teachers' applicable technology strategies could be taught to support them in improving their teaching style and pedagogy (Kim & Kim, 2017). This can help teachers understand how to limit barriers such as lack of time to prepare, how to deliver lessons, lack of knowledge about technology, and improve their learning style and teaching style (Thoma et al., 2017). Schools should consistently

provide opportunities for teachers improve their technology skills because teachers' technology beliefs shape their teaching philosophy (Schrum & Glassett, 2006). This is essential because when teaching is supported by technology it facilitates effective student learning as students learn the content that is being taught (Yildirim & Sensoy, 2018). Since traditional approaches are viewed as been inadequate, the integration of technology is considered a possible approach to support learning and teaching (Yildirim & Sensoy, 2018).

### **Policy**

Educational policy that advances technological innovations in classroom throughout the United States will develop technologically literate students for the future (Hosman & Cvetanoska, 2013). This policy should emphasize that teachers receive ongoing support, encourage collaborative work among teachers, comprehensive training in technology and strategies of how to integrate technology in their curriculum so that teachers will consistently teach with technology (Hosman & Cvetanoska, 2013). The policy can serve as a lens to understand how a teacher's experience with technology can influence their learning style and teaching style. As the use of technology is encouraged in education the belief that teachers will adopt and incorporate it in their teaching is not true. Some teachers' resistance may be a result of their lack of experience with technology. Policy should take into consideration and acknowledge teacher concerns about technology and provide the necessary training experience for teacher so that they can incorporate technology in their pedagogy.

### **Theory**

The findings of this research study suggested that through personal experience knowledge is shaped through individual experience (Stake, 1995). Teachers constructed their

knowledge through their learning, experience, perception and their academic knowledge. The research study supported the theory that through personal experience individuals construct their own knowledge and understanding about the world. The teachers in this research study reflected and made meaning of technology and how it influenced their teaching style and learning style through their experience, perception, knowledge and learning. This reflection by teachers aligns with constructivism where knowledge is constructed rather than it being uncovered (Stake, 1995).

Furthermore, the findings in this research study illustrated that teachers' use of technology in the classroom is implemented according to teachers' experiences and their constructed beliefs. The data showed that teachers lacked consistent professional development in technology, which they believe is necessary to help them improve their technology proficiency. The teachers noted that without professional development workshop that focuses on technology, they are left construct their own understanding of technology and how to implement it in their instructional practice. The data also demonstrated that theories about teachers' experience with technology cannot be used to create experience or knowledge, but theories can be developed through teachers' construction of knowledge through their own understanding and experience.

### **Recommendations for Further Research**

My recommendation for further researchers is that this study should be replicated. If replicated, the participants should include teachers from both the elementary school and high school. Additionally, another methodological approach such as a quantitative approach or mix method approach could be used. These approaches should be used to analyze the data which

could strengthen or disagree with the results but would provide a richer deeper understanding of the findings when comparing both findings.

There are advantages of using a quantitative approach. The quantitative approach uses statistical data which diminishes the amount of time the researcher would spend interpreting the findings because data would be calculated by a computer (Eyisi, 2016). A second advantage of quantitative research is that the method used to conduct data collection opens the possibility to make generalization about uses the data after analyzing it (Eyisi, 2016). Since the quantitative approach uses hypotheses testing it has succinct guidelines as to how to interpret the findings instead of relying on the researcher's interpretation (Eyisi, 2016). One disadvantage with the quantitative approach is that the researcher is an observer which makes it challenging for them to collect rich and thick data in the participants natural setting (Eyisi, 2016). However, in a quantitative approach analyzed data is easier to replicate and get the same findings (Eyisi, 2016).

For future research another approach should be used to replicate this study. This approach could be the mixed method approach. In a mixed method approach the sample group is larger than in a qualitative approach. The researcher's instrument for the quantitative component of the study would include a survey with several items included on a Likert scale (Mohamed, 2018). For the qualitative part of the study a semi structured interview would be conducted with a small sample of participants (Mohamed, 2018). For future research using a mixed method approach which included both quantitative and qualitative data would strengthen the findings and level any limitations both methods may have demonstrated. Using the mixed method approach to replicate this research study will inform how teachers experience with technology provides an understanding about their learning and teaching style with technology integration.

Using multiple methods of data collection and analysis will inform the researcher about the link between teachers experience and their learning and teaching style in their daily pedagogy. Another question the research study did not investigate was whether teachers' belief is connected to their experience. Although some of the literature discussed this topic, this research study did and also investigated if there were any link to the research question. However, this research study noted that the more a teacher use and learn about technology the more experience they gain from their interaction with technology. Further research could include students' perspective on teachers who use technology consistently or inconsistently in their class.

### **Conclusion**

The purpose of this qualitative research study and this chapter was to understand how teachers' experiences with technology provide an understanding regarding their learning style and teaching style. The key points were that the participants believed that teaching with technology is important because it increase student engagement and eagerness about learning. They believed their experience with technology has helped them to find ways to consistently include technology in their pedagogy. Using technology to facilitate learning participants believed it's another way for them to deliver instruction. Many of the participants also believed that technology has improved their learning style. They believed that since most of the technology used is visual and auditory both learning styles have become more sharpen as a result of them including it in their instruction.

The research indicated that current teachers need professional development in their content area to improve their understanding of how to teach with technology. This is essential because teachers still grapple with how to use technology to accomplish their curriculum goals in

their pedagogy. Many teacher participants in this research study explained that their experience with technology influenced their teaching style and learning style when integrated technology in their classroom instruction.

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### **Appendix A: Hatch (2002) Steps in Inductive Analysis**

1. Read the data and identify frames of analysis
2. Create codes based on semantic relationships discovered within frames of analysis.
3. Identify salient codes, assign them a code, and put others aside.
4. Reread data, refining salient codes and keeping a record of where relationships are found in the data.
5. Decide if your codes are supported by the data and search data for examples that do not fit with or run counter to the relationships in your codes.
6. Complete an analysis within codes.
7. Search for themes across codes.
8. Create a master outline expressing relationships within and among codes.
9. Select data excerpts to support the elements of your outline.



## Appendix B: Interview Questions

1. How would you define technology integration?
  - In the school?
  - In your classroom?
  - Are you comfortable integrating it in your instructions?
2. How have you incorporated technology in your pedagogy? Do you believe it makes you a more effective teacher?
3. What obstacles have you encountered using technology in your classroom? What strategies have you used to overcome those obstacles?
4. Do you believe the school has supported technology integration in your classroom? Can you elaborate?
5. How has your experience helped or hindered:
  - Your learning style?
  - Your teaching style?
6. Do you perceive technology can meet the academic needs of students? Can you elaborate?
7. What is your perception as to why some teachers have not integrated technology or do so consistently in their instructions?
8. What is your educational philosophy about technology use in the classroom and how it affects your decision about technology use in the classroom?

### Appendix C: Observation Checklist

#### Observation Checklist

- |  | YES                        | NO |
|--|----------------------------|----|
| 1. Is technology in the classroom?   |                            |    |
| 2. Is technology used by teacher?  |                            |    |
| 3. Is technology used by students?   |                            |    |
| 4. Is technology necessary for the learning and teaching activity?             |                            |    |
| 5. Are there multi types of technology used by teachers and students?          |                            |    |
| 6. Is there technology available to accommodate students with special needs?   |                            |    |
| 7. Are the students engage with the technology or they are passive recipients? |                            |    |
| 8. Was the teacher prepared to use the technology?                             |                            |    |
| 9. What technology methods were used during instructions?                      | ___ accessing information  |    |
|  | ___ processing information |    |
|  | ___ producing information  |    |
| 10. How did the teacher introduce technology use for the lesson?               | _____ model                |    |
|  | _____ lecture              |    |

What did the teacher do if he/she needed help with the technology?

### **Appendix D: Second Interview Questions**

1. Explain if you believe a technology professional development in the subject you teach can improve your instructional practice?
2. Do you believe technology is connected to your instructional practice? Can you elaborate?
3. How does your preferred learning style help you when teaching and using technology in your instructional practice
4. Can technology improve your learning style? Can you elaborate?

## **Appendix E: Summary of Tessa's Interview**

### **First Interview Data**

To analyze the interview data collected, I first audio recorded the interviews. The audio of the interviews was saved on a USB and then sent to Rev to be transcribed. Each interview was transcribed into a hard copy of the document by Rev which was sent back to me. I read over the interview document and then typed a one page summary for each teacher participant by condensing their interview into a simple narrative account. For example, Tessa who teaches mathematics interview summary detailed her experience with technology. Tessa has been teaching for 30 years and is comfortable integrating technology in her instructions. Tessa believes that technology is a great tool that enhances her instruction and engages the students in her class. One way technology is used to support her instruction is that all the mathematic lessons she teaches throughout the academic year is recorded. Her recorded lessons are 15 minutes long and is available for students to watch at their pace and time. Additionally, Tessa uses a website to assign her students practice work for them to complete. Tessa noted that one obstacle with technology is that there are so many apps and website to choose from, as a result she is sometimes overwhelmed with the choices.

Tessa mentioned that technology has made her a more effective teacher because she is able to get information out and get it back quickly to and from her students. She further claimed that technology has helped her learning style visually, but she gets distracted with all the things you can see visually with technology. Additionally, Tessa believes that her teaching style has been enhanced. She noted that she is able work with groups independently using technology. For example, Tessa indicated that she is able to assign groups of students work on the computer while she works with a smaller group. This she noted helps in reaching various learning levels and academic need of her students.

## **Appendix F: Summary of Jack's Observation**

To analyze the observation data, I first collected data using a checklist created by me. For example, Jack who is a social studies teacher has been teaching for 8 years. Jack believes that the use of technology can reach the academic needs of students when applied correctly. He believes that if there is no follow up on the information that students learn, then gaps in learning can occur. On the day I visited Jack's class his students were in the library researching information on a project they were working on. I sat in the back of the classroom to observe and used my observation checklist to gather data.

Before the students started their research, Jack modeled to the students using the smartboard explaining how students should carry out their research. He also recommended sites they could use to help them with their research project. I observed that all students had their individual laptops to carry out their research. Additionally, support was provided to accommodate special needs student. One student uses a pair of headphones to listen to the information that was been read to them as they completed their research. Another student who had limited English vocabulary had information translated to using the headphones as they completed their research. This information and notes were recorded as data on my observation checklist.

## **Appendix G: Summary of Philip's Interview**

### **Second Interview Data**

To analyze the 2nd interview data collected I met with six teacher participants and wrote down their responses to the questions asked. I clarified responses I didn't understand to make sure I understood their responses. At the end of the interview, I read over the interview and typed a one page summary for each teacher participant that was a part of the 2nd interview. I condensed their interview into a simple narrative account. For example, Philip who teaches English Language Arts and has been teaching for eight years further explained his experience with technology. Philip noted that technology is connected to his instructional practice. He indicated that he uses Google docs and Google slides frequently. He uses these for digital assignments which give him the opportunity to provide immediate feedback for his students which has improved his instructional practice. Using google also allows him to share graphic organizers, model writing samples, rubrics, checklist and images. He noted that this gives students everything they need at their fingertips.

Philip further commented about his learning style with technology. He noted that technology has helped him, but it can also be distracting. Technology has helped his visual but he gets distracted when he has several windows opened at the same time. He indicated that "technology can cause me to take a tangent, spend too much effort in one area and be slow to complete a task." Despite this he believes it's a great resource for both students and teachers because his experience with technology has helped both his learning style and teaching style.

## Appendix H: Themes With Codes Within the Data That Support the RQ

Theme	Code
1. Teaching with technology	TI, LN, SN, TR
2. Learning with technology	LS, IA, LK
3. Technology as an exploration tool	C, T, TE
4. Technology as a hindrance	AU, TB
5. Teacher's philosophy regarding technology	TB

---

Key: TI = Technology and instruction; LN = Language Needs; SN = Special Needs;  
TR = Technology Resource; LS = Learning Style; IA = Information Access; LK = Lack of  
Knowledge; C = Collaboration; T= Technology; TE= Technology Experience, AU = Applicable  
use; TB = Teacher belief;

## **Appendix I: Coding**

Coding is a strategy that is used to analyze qualitative data. Coding data is collected from data such as interviews, observations and other documents that is used throughout the study (Stake, 1995). Coding can be used to help interpret and analyze complex information (Stake, 1995). I used the inductive analysis (Hatch, 2002) to analyze my data and create codes that are pertinent to the research study. From there a code bank was created from the interviews, observations and member check which align with my research study.



## Appendix J: Terms, Semantic Relationships, and Cover Terms

<i>Included Terms</i>	<i>Semantic Relationship</i>	<i>Cover Term</i>	<i>Codes</i>
Google Classroom			
Videos			
Interactive games	are ways to	learn with	LS, IA, TI
Google Doc		technology	
Google slide			
Virtual Field Trips			

<i>Included terms</i>	<i>Semantic Relationship</i>	<i>Cover Term</i>	<i>Codes</i>
Computers,			
Laptops			
Phones	types of	technology	T, TE, TR
Smartboards		tools	
Document camera			
Graphing calculator			

Key: TI = Technology and instruction; TR = Technology Resource; LS = Learning Style;  
 IA = Information Access; T= Technology; TE= Technology Experience,

## **Appendix K: Informed Consent Documentation**

**Research Study Title:** How do teachers experience with technology provides an understanding regarding their learning style and teaching style?

**Principal Investigator:** Andrea Tennant

**Research Institution:** Concordia University

**Faculty Advisor:** Dr. Heather Miller

### **Purpose and what you will be doing:**

The purpose of this survey is to investigate “how do teachers experience with technology provides an understanding regarding their learning style and teaching style?” We expect approximately nine volunteers. No one will be paid to be in the study. We will begin enrollment on 03/01/2018 and end enrollment on 04/30/2018. To be in the study, you will answer questions related to your technology experience, then you will be observed using technology in your classroom and then complete a member check by checking if the information recorded about you is accurate. Doing these things should take less than three of your time.

### **Risks:**

There are no risks to participating in this study other than providing your information. However, we will protect your information. Any personal information you provide will be coded so it cannot be linked to you. Any name or identifying information you give will be kept securely via electronic encryption or locked inside a file cabinet. When we or any of our investigators look at the data, none of the data will have your name or identifying information. We will refer to your data with a code that only the principal investigator knows links to you. This way, your identifiable information will not be stored with the data. We will not identify you in any publication or report. Your information will be kept private at all times and then all study documents will be destroyed 3 years after the study is concluded.

### **Benefits:**

Information you provide will help to understand how to better utilize technology in classroom instructions with regards to a teacher’s learning and teaching style.

### **Confidentiality:**

This information will not be distributed to any other agency and will be kept private and confidential. The only exception to this is if you tell us about abuse or neglect that makes us seriously concerned for your immediate health and safety.

**Right to Withdraw:**

Your participation is greatly appreciated, but we acknowledge that the questions we are asking are personal in nature. You are free at any point to choose not to engage with or stop the study. You may skip any questions you do not wish to answer. This study is not required and there is no penalty for not participating. If at any time you experience a negative emotion from answering the questions, we will stop asking you questions.

**Contact Information:**

You will receive a copy of this consent form. If you have questions you can talk to or write the principal investigator, at [email redacted]. If you want to talk with a participant advocate other than the investigator, you can write or call the director of our institutional review board, Dr. OraLee Branch (email [obranch@cu-portland.edu](mailto:obranch@cu-portland.edu) or call 503-493-6390).

**Your Statement of Consent:**

I have read the above information. I asked questions if I had them, and my questions were answered. I volunteer my consent for this study.

_____	_____
Participant Name	Date
_____	_____
Participant Signature	Date
_____	_____
Investigator Name	Date
_____	_____
Investigator Signature	Date



Investigator: Andrea Tennant; email: [redacted]  
c/o: Professor Dr. Heather Miller  
Concordia University–Portland  
2811 NE Holman Street  
Portland, Oregon 97221

## Appendix L: Permission to Conduct Research Study

February 28, 2018

Andrea Tennant

**RE: Application xxxxx**

Dear Andrea Tennant:

Your request to conduct research in the xxxxxxxx Public School System has been approved. We wish you well in conducting your study answering the question, “How do teachers experience with technology provides an understanding regarding their learning style and teaching style?”

Please share this approval letter with school staff as you request their participation. **They will make the final decision about whether to participate.**

Refer to your project number (xxxx) in further correspondence with us. We look forward to learning your results.

Please remember to send us a status report by August of each year (specifying whether you have completed data collection and when results will be available) and a summary of your findings once the project is complete.

Let us know if you have questions.

Sincerely,

xxxxxxxxxxxxx  
Director for Testing  
Data, Research, &  
Accountability

## **Appendix M: Statement of Original Work**

The Concordia University Doctorate of Education Program is a collaborative community of scholar-practitioners, who seek to transform society by pursuing ethically-informed, rigorously-researched, inquiry-based projects that benefit professional, institutional, and local educational contexts. Each member of the community affirms throughout their program of study, adherence to the principles and standards outlined in the Concordia University Academic Integrity Policy. This policy states the following:

### **Statement of academic integrity.**

As a member of the Concordia University community, I will neither engage in fraudulent or unauthorized behaviors in the presentation and completion of my work, nor will I provide unauthorized assistance to others.

### **Explanations:**

#### ***What does “fraudulent” mean?***

“Fraudulent” work is any material submitted for evaluation that is falsely or improperly presented as one’s own. This includes, but is not limited to texts, graphics and other multi-media files appropriated from any source, including another individual, that are intentionally presented as all or part of a candidate’s final work without full and complete documentation.

#### ***What is “unauthorized” assistance?***

“Unauthorized assistance” refers to any support candidates solicit in the completion of their work, that has not been either explicitly specified as appropriate by the instructor, or any assistance that is understood in the class context as inappropriate. This can include, but is not limited to:

- Use of unauthorized notes or another’s work during an online test
- Use of unauthorized notes or personal assistance in an online exam setting
- Inappropriate collaboration in preparation and/or completion of a project
- Unauthorized solicitation of professional resources for the completion of the work

### Statement of Original Work (Continued)

I attest that:

1. I have read, understood, and complied with all aspects of the Concordia University- Portland Academic Integrity Policy during the development and writing of this dissertation.
2. Where information and/or materials from outside sources has been used in the production of this dissertation, all information and/or materials from outside sources has been properly referenced and all permissions required for use of the information and/or materials have been obtained, in accordance with research standards outlined in the *Publication Manual of The American Psychological Association*

*Andrea Tennant*

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Digital Signature

Andrea Tennant

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Name (Typed)

March 29, 2019

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Date