Digital Immigrant Teachers and Their Implementation of Technology

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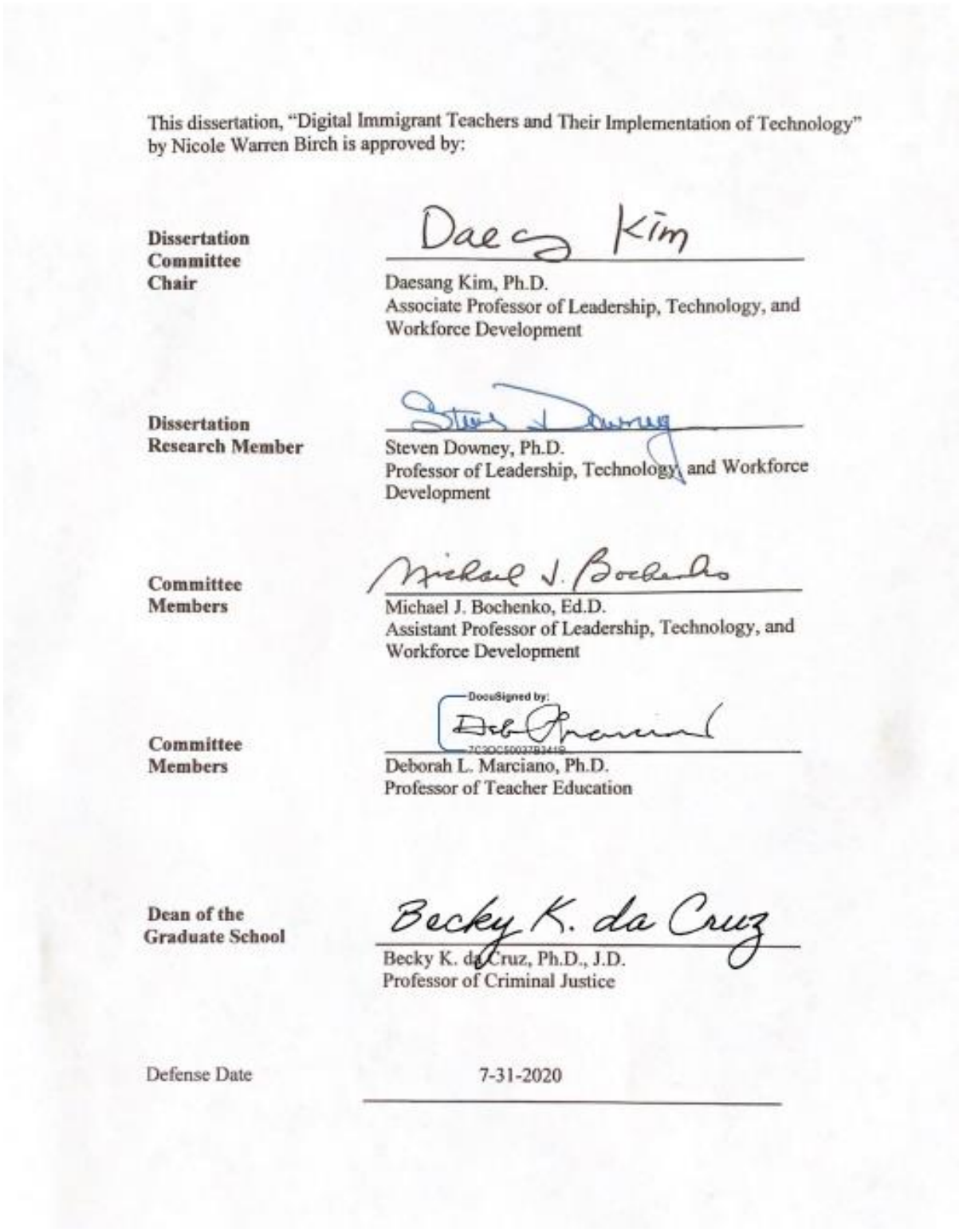

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Abstract

As educators now welcome students who have spent their lives immersed in technology, far removed from the passive learners of the past, a shift has had to occur in order to meet these students' needs and learning styles. However, many educators who are teaching these students have not spent their lives immersed in technology and must master technology in order effectively teach these students. This qualitative study examined teachers who were born before 1980, Digital Immigrants, who have effectively integrated technology into their instruction of students born after 1980, Digital Natives. Participants were culled from two public school systems through an on-line survey, where participants self-ranked a LoTi level. Participants took part in three in-depth interviews, a classroom observation, and submitted lesson plans for review. The study revealed several participants attitudes had shifted to recognize the crucial role technology plays in their teaching throughout their teaching career, while others had a positive attitude toward technology from the start of their career. The challenges faced by participants were relatively similar in that students themselves posed challenges, along with time and access to technology. Implications of the research suggest it is realistic for Digital Immigrant teachers to effectively implement technology into their teaching of Digital Native students. As technology continues to advance at lightning speed, the knowledge gap between educators and students will remain and it is crucial educators continue to work to bridge the gap, in order to effectively address students' learning styles and needs.

Keywords: Digital Immigrants, Digital Natives, Technology Implementation

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ACKNOWELDGEMENTS

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DEDICATION

This work is dedicated to my family, who has tirelessly encouraged me to pursue my doctorate and has always believed in me. I would not be where I am today without all of you and your steadfast belief in me.

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Chapter I

INTRODUCTION

As society moved from the Industrial Age to the Information Age, many crucial paradigm shifts occurred (Pelgrum, 2001). These shifts have taken place not only globally, but in many areas of daily life, such as banking, shopping, mail systems, global communication systems, and even churches (Ayanso, Cho, & Lertwachara, 2014; Cherry, 2014; Mueller, Wood, Willoughby, Ross, & Specht, 2008; U.S. Department of Education, 2010). Where once customers travelled to a bank location to make a transaction, drove to the mall to buy an article of clothing, walked into the post office to mail a package, or sat in church to put money in a collection plate, all of these actions can now be accomplished from computers, tablets, and even smart phones (Brickman-Kealey, 2012; Duff, 2013; Petrasic & Hastings, 2013; Wu & Ke, 2015). As these shifts occurred, overall reliance on technology increased (Czaja, et al., 2006; Hew & Brush, 2007; Pelgrum, 2001; U.S. Department of Education, 1996, 2010). Cilesiz (2011) asserted the changes seen within the realm of technology range from subtle to transformational. Ayanso et al. (2014) and many others (Min, 2010; U.S. Department of Education, 1996; Valadez & Duran, 2007) noted the crucial role of technology in not only social and economic events, but also its influence on global political events.

Spring (1997) and Cherry (2014) discussed how society in general, and education in particular, experienced a metamorphosis due to the influence of immigration, industrialization, and urbanization during the 1970s and 1980s. Whereas schools were once concerned with preparing students for their place in the workforce, school focus shifted with a concern for social and economic issues and with preparing students for the changing workforce, which is expected to result in the economy's growth (Partnership for 21st Century Skills, 2007; Spring, 1997). With the increase of society's reliance on Information Communication and Technology (ICT), it is only logical the infrastructure of education has experienced a similar paradigm shift incorporating the increased use of and reliance on technology (Ayanso et al., 2014; Pelgrum, 2001). Valdez and Duran (2007) reported schools in the United States having parallel growth in computer and Internet use similar to national trends in other arenas. This view was supported by Buabeng-Andoh (2012) who stressed the crucial role of ICT and its importance in daily lives and the educational system. Howland, Jonassen, and Marra (2012) discussed the importance of rethinking the educational process if technology is to be used to engage students in meaningful learning.

To address the nation's desire to close the achievement gap, President George W. Bush introduced Public Law 107-110, more commonly referred to as the No Child Left Behind/NCLB Act of 2001 (No Child Left Behind [NCLB], 2002). While there were many aspects to NCLB that were designed to deal with education, Title II, Part D, Enhancing Education Through Technology, specifically addressed the technological paradigm shift and its effect on education. The primary goal of Enhancing Education Through Technology was to promote the use of technology in elementary and secondary

schools to improve students' academic achievement (NCLB, 2002). This part of NCLB stated all students will be technologically literate by the eighth grade, the use of technology will improve students' academic performance, and with proper training, teachers will integrate technology into classroom instruction. Enhancing Education Through Technology allocated additional funding to schools in order to provide more resources and support to teachers as they integrated technology into their instruction (NCLB, 2002).

As technology use and dependence increased over time, an additional law was passed in 2007. President George W. Bush signed Public Law 110-69, otherwise known as the America Creating Opportunities to Meaningfully Promote Excellence in Technology, Education, and Science Act, or known as America COMPETES (U.S. Department of Education, 2007). The purpose of the law addressed the United States' continued innovation in industry and commerce in the 21st century (U.S. Department of Education, 2007). The focus of the law was trifold: increase research investment, strengthen opportunities in science, technology, engineering, and mathematics from elementary through graduate school, and develop an innovation infrastructure (U.S. Department of Education, 2007). Continuing the focus of participating in the 21st century innovations, in 2011 President Barak Obama signed the America COMPETES Reauthorization Act of 2010 with the continued focus on economic competitiveness through expenditures in science and technology (U.S. Department of Education, 2011).

In 2007, the State Educational Technology Director's Association (SETDA), the International Society for Technology in Education (ISTE), and the Partnership for 21st Century Skills released the report, *Maximizing the Impact: The Pivotal Role Of*

Technology In A 21st Century Education System (Partnership for 21st Century Skills, 2007). The report urged policy makers at the federal, state, and local levels to take action on multiple fronts in regard to technology use in schools. Each area of emphasis centered on the comprehensive use of technology. The first area dealt with using technology with students in order to become proficient in 21st century skills as mastery of traditional core subjects alone is no longer enough to succeed in a global marketplace. The second area of emphasis was comprehensive use of technology to engage students in meaningful, hands-on learning experiences to demonstrate acquired skills and knowledge. The third prong provided technology support systems to assist and equip teachers and administrators to achieve proficiency in 21st century skills themselves.

Just as there were learning standards for students in traditional core subject areas, ISTE created standards for technology for students (ISTE*S), administrators (ISTE*A), coaches (ISTE*C), computer science educators (ISTE*CSE), as well as classroom teachers (ISTE*T) (Howland et al., 2012; ISTE, n.d.). In contrast to traditional learning standards, which focused on students and their expected level of understanding and performance, the ISTE standards addressed technology for learning and application of skills. The current ISTE standards evolved from the original standards created in 1988. According to ISTE (iste.org, n.d.) the first generation of standards were centered around students learning to use technology. In 2007, the standards evolved to shift the focus from the use of technology to using technology to learn. The current ISTE standards were created with the purpose of empowering students with a voice and promote a student driven transformative learning process. The student standards fall under seven main benchmarks with four indicators under each main domain. These categories are:

Empowered Learner, Digital Citizen, Knowledge Constructor, Innovative Designer, Computational Thinker, Creative Communicator, and Global Collaborator. The student standards have undergone revision and were released in 2016 (iste.org, n.d.).

The ISTE*T standards specify teachers in K-12 settings should model current digital age work and learning, create and develop digital age learning experiences and assessments, and teach students how to engage in responsible digital citizenship (Cherry, 2014). Traditionally, teachers have been evaluated on the instruction of traditional core subjects, however with the introduction of new technology standards, evaluation can encompass the integration and use of technology.

The teacher standards benchmarks are: Learner, Leader, Citizen, Collaborator, Designer, Facilitator, and Analyst. Unlike the students' standards, half of the benchmarks have four indicators and the other half have three indicators. The Learner standard focuses on the educator as a learner who learns from and with others (iste.org, n.d.). The Leader standard's goal is for educators to take leadership opportunities for student empowerment and successful implementation of teaching and learning (iste.org, n.d.). The Citizen standard focuses on the educator's responsibility for a positive role model of a digital citizen (iste.org, n.d.). The Collaborator standard emphasizes collaboration with both colleagues and students to improve practices, share resources, and solve problems (iste.org, n.d.). The Designer standard centers around the educator who designs authentic, learner driven activities and environments (iste.org, n.d.). The Facilitator standard focuses on the educator facilitating learning with technology (iste.org, n.d.). The Analyst standard brings in assessment, in that educators should understand and use data to support students and drive instruction (iste.org, n.d.).

According to the ISTE website, the ISTE standards are not limited to use by educators in all 50 states, but used globally as well. The website states 20 states have formally adopted or adapted the ISTE standards. The student standards were revised in 2016 with revised teacher standards expected in late 2017 (iste.org, n.d.).

Other evaluation tools may be used to determine a teacher's effective use of technology. The evaluation tool used in my state and in the county in which the research was conducted contains instructional technology as one aspect of performance standards. One of the indicators in Performance Standard 3: Instructional Strategies, encompasses the teacher using appropriate instructional technology effectively in order to enhance student learning. This indicator is part of every teacher's summative evaluation.

As technology availability and use increased in education, Moersh (1995) devised a framework to evaluate a teacher's implementation of technology in instruction. The Levels of Teaching Innovation (LoTi) framework is used to measure the extent to which a teacher is implementing meaningful technology integration in the classroom, if there is improved use, and if there is an impact on student learning (Moersch, 1995). The framework is a spectrum of seven differing levels of implementation. While the Levels of Teaching Innovation (LoTi) framework has been modified from its original version, it is still used to assess a teacher's meaningful and authentic technology use (LoTi Connection, n.d.). The lowest end of the framework is Non-Use, at Level Zero. The continuum then ranges to Refinement, which is Level Six. As there is advancement and growth through the framework, the teacher shifts from a teacher-centered approach to learning, to a learner-centered instructional focus. Progression toward the higher levels of instruction changes from a teacher-used tool to one that is integral to students' higher-

order thinking and processes. Traditional lecture and direct instruction will give way to hands-on, student-centered learning activities (Moersch, 1995).

With this increased focus on technology throughout society and education came the issue of digital divide. Compaine (2001) defined the digital divide as referring "to the perceived gap between those who have access to the latest information technologies and those who do not" (p. 160). Additional goals of NCLB Part D (NCLB, 2002) addressed this issue of students and digital divide in reference to technology integration. Part D aims to ensure every student becomes technologically literate by the time they complete eighth grade as well as addressing the need to include effective technology training and integration in order to implement best practices for instructional methods (NCLB, 2002).

Further expanding on the concept of digital divide or the "have" and "have nots", Prensky (2001a) originated the terms "digital immigrant" and "digital native". These terms became synonymous with digital divide and its components. According to Prensky (2001a) a digital immigrant is anyone born before 1980 and to whom technology is not seamless. Digital natives are born after 1980 and have lived a life immersed in advanced technology. Digital natives have also been referred to as the Net Generation (Tapscott, 1998), Generation M^2 (Rideout, Foehr, & Roberts, 2005), the Millennial Generation (Howe & Strauss, 2000; Lenhart, Purcell, Smith, & Zickuhr, 2010), the Look Down or Head Down Generation (Larrua, 2009; Trends, 2011) or the iGeneration (Rosen, 2011).

Helsper and Eynon (2012) revised Prensky's definition of a digital native and expanded it to a second-generation category of those born after 1990. Lenhart et al. (2010) reported in their survey of 800 adolescents, age 12-17, and 2,253 adults, age 18 and over, 93% of digital natives, age 12-29, use the Internet as opposed to 63% of digital

immigrants over the age of 30 who use the Internet. This percentage continues to decrease as digital immigrants age, down to 34% of digital immigrants age 50 and up. Kennedy, Judd, Dalgarno, and Waycott (2010) stated each consecutive generation is embracing technology at an increased rate, as opposed to their predecessors. In further support of this contrast between digital immigrants and digital natives, Walling (2012) stated digital natives, "are not only wired (or wireless) but also adept at digitally cocooning when left to, literally, their own devices". Digital cocooning, or insolating or isolating, oneself is an increasing trend with digital natives (Walling, 2012).

Helsper and Eynon (2012) presented Tapscott's (1998) slightly different view, rather than strictly generational differences to differentiate between immigrants and natives, the gap could have more to do with exposure to, and experiences with, technology. Hohlfeld, Ritzhaupt, Barron, and Kemker (2008) found there was statistical significance between high and low socioeconomic status schools providing evidence of a digital divide. Further support of a digital divide being created by a difference in socioeconomic status was also found by Valadez and Duran (2007) in their study of schools in California. Valadez and Duran (2007) reported despite an increase of availability of computers and Internet use, low socioeconomic and low performing high schools continue to lag behind high socioeconomic schools in many areas of computer and Internet use.

Min (2010) and Reinhart, Thomas, and Toriskie (2011) concurred it was not only generational differences which contribute to a digital divide. Their crucial variable, however, differed in that it is *how* one uses technology which creates a divide. This added variable has been used to categorize a second level of digital divide. Hohlfeld et

al. (2008) addressed this as the frequency with which technology is being used by teachers and students and its intended purpose. While many digital immigrant teachers may be using technology, it is in a manner which makes tasks they are already doing easier, rather than to transform their teaching, for example using a Power Point presentation, in place of presenting information on an overhead projector (Inan & Lowther, 2010; Wallace, 2012). In order to meet the needs of today's digital immigrant students, it is crucial for teachers to integrate technology in a meaningful manner, rather than use technology for low-level tasks (Rifkind, 2011).

Statement of the Problem

With the change in elementary and secondary school student population moving to digital natives, it seems imperative for education as a whole, and teachers specifically, to evolve to address the learners they are teaching (Cherry, 2014; Howland et al. 2012; Nasah, DaCosta, Kinsell, & Soek, 2010). Prensky (2001b) pointed out the differences in how digital immigrants and digital natives acquire knowledge; digital immigrants were taught in a teacher-centered, face-to-face learning environment in which core subject areas were taught independently of each other. Digital natives are integrating core subjects and doing so in a hands-on, student-centered, meaningful learning environment, with heavy reliance on technology. Graham, Tripp, and Wentworth (2009) agreed many teachers are digital immigrants who do not function well within the world of technology as compared to students who have grown up seamlessly using technology in almost every aspect of their lives. The National Center for Education Statistics (NCES) Digest of Education Statistics (2013) reported digital natives comprise approximately 15% of the teaching force in public and private elementary and secondary schools in the 2011-2012

school year. This is in stark contrast to 85% of digital immigrant teachers who are teaching digital native students. These statistics supported Graham et al.'s assertion there is a large number of digital immigrant teachers in the public school setting, which supports the possible disconnect between digital immigrant teachers in this study and digital native students.

Tondeur, Valcke, and Van Braak (2008) reported teachers who have less experience with technology tend to integrate technology less than those who have more computer experience. These teachers represent the low end of the Moersch (1995) LoTi framework. The ensuing disconnect between digital immigrant teachers and digital native students affects how teachers teach and students learn (Nasah et al., 2010). Hohlfeld et al. (2008) and Rifkind (2011) discussed the importance of educating educators to improve ICT skills to keep pace with their students.

There is a large body of evidence supporting an increase in meaningful technology use by students in the classroom can lead to an increase in student achievement (Dileo, 2007; Heffernan, 2012; Lowther, Inan, Strahl, & Ross, 2008; Mundy, Kupczynski, & Kee, 2012; Walker, 2010; Yang & Tsai, 2010). In order for this to be possible, digital immigrant teachers must be able to meaningfully integrate technology for instruction and learning. Huang and Russel (2006) explored the concept of digital divide in three Oklahoma Public Schools and noted the divide did exist with students and academic achievement was affected by the gap

Purpose of the Study

The Georgia Department of Education (2014) reported as student population and the number of classrooms in Georgia have increased, so has the number of classrooms

with high-speed Internet access, as well as technology access. From 2007 to 2014, there has been an increase of 61,333 students statewide. This has resulted in 1,051 more classrooms across the state and an increase of 485 classrooms with high-speed Internet access (Georgia Department of Education, 2014). According to the district's TY 2019 Budget Overview, the district saw and increase of student enrollment over the past 10 years by approximately 1, 958 students. The county projects an increase of more than 3,000 students in the next 10 years. (Paulding County Schools, 2019).

Mueller, Wood, Willoughby, Ross, and Specht (2008) discussed most of the previous research studies conducted on teachers' technology integration focused mainly on environmental factors and not a teacher's status as a digital immigrant who is teaching digital natives. In 2012 Wallace cited the under-examined relationship of a teacher's status as a digital immigrant to technology use as the impetus for the study of the barriers digital immigrant teachers face when adopting technology. Cherry (2014) stressed digital immigrants, who accounted for 79% of the participants in her study, had to alter and adapt how they work and learn in this digital age and may use technology differently when teaching and learning. To address this gap in the research, the present study examined public school teachers as digital immigrants and the critical attitudes, challenges or beliefs that may have shaped them to accept and integrate meaningful technology implementation in their teaching practices.

Research Questions

In order to understand how digital immigrant teachers successfully bridged barriers to technology in order to meaningfully integrate technology in their classrooms, the following research questions were used for this study:

1. How have digital immigrant teachers' attitudes towards technology in the classroom changed over the course of their teaching?
2. How have digital immigrant teachers use of technology changed over the course of their teaching career?
3. What are the challenges digital immigrant teachers face as they implement technology into their teaching?

Conceptual Framework

With the rapid expansion of technology and its use, over the past two decades many different influential technology acceptance models have been proposed by researchers. Venkatesh, Morris, G. Davis, and F. Davis (2003) conducted a meta-analysis of the eight most prominent models of use acceptance. Their study reviewed the theory of reasoned action (TRA), the technology acceptance model (TAM), the motivational model (MM), the theory of planned behavior (TPB), a model that is a combination of TAM and TPB, the model of PC utilization (MPCU), the innovation diffusion theory (IDT), and the social cognitive theory (SCT). The result of Venkatesh et al.'s study was the creation of a new model, the Unified Theory of Acceptance and Use of Technology (UTAUT), which unified the eight previously mentioned models. The UTAUT model was considered for the conceptual framework of this study. However, as these models do not focus specifically on teachers, they were not chosen for the conceptual framework. As this study investigated the lived experiences of teachers who use technology, it is crucial the conceptual framework address the issue of technology in the classroom.

The Levels of Technology Implementation (LoTi) framework was created by Christopher Moersch in 1995. This framework evolved from several different frameworks, as well as Moersch's own observations in classrooms nationwide (Moersch, 1995, 2001, 2002). Moersch's framework was shaped by findings from the Apple Classrooms of Tomorrow (ACOT) and the Concerns-Based Adoption Model (CBAM) (Moersch, 2001, 2002). Moersch's impetus for creating the framework was to address what he perceived to be a gap in the detached role of technology in the classroom and set a consistent set of measures to reflect technology use (Moersch, 1995, 2001).

Moersch's (1995) model focuses on instruction and assessment. The original purpose of LoTi was to support school districts and school leaders in restructuring staff curriculum, in order to include technology for authentic uses or as a catalyst for change, as opposed to sustaining existing curriculum and teaching that used technology for isolated purposes (Moersch, 1995, 2001). The framework provides an objective avenue to measure the use of technology in instruction (Moersch, 1995). This framework spans from Level zero, Nonuse, to Level six, Refinement (Moersch, 1995). Details of the framework can be found in Chapter Three.

The ISTE NET's and Partnership for 21st Century Skills development in 2010 resulted in a revision of Moersch's framework (Farsaii, 2014; Moersch, 2014). The revision, while maintaining the original six levels, came with a name modification; changing from Levels of Technology Implementation to Levels of Teaching Innovation. The six levels now reflected a shift from the effective use of technology resources to student-centered learning and higher-order thinking (LoTi Connection, n.d.). The revised framework looked for a balance between, "instruction, assessment, and the effective use

of digital resources to promote…engaged student learning, and authentic assessment practices in the classroom-all vital characteristics of 21st Century teaching and learning" (LoTi Connection, n.d.). The revised framework continued to show the difference between teacher-directed, practice based activities, at levels one through three, and student-directed, problem based activities, in levels four through six (Moersch, 2014). Moersch considered level three to be the starting level for best practices in the digital age (Moersch, 2014).

The LoTi framework was chosen for the conceptual framework for this study, as it was created for use in an educational setting and allows for teacher self-directed analysis of their teaching with technology and supports the analysis of their pedalogical approach to learning. In addition, the LoTi framework provides a direct foundation for use of the LoTi "Sniff" Test, which will be used as a filter for participant selection.

Definition of Terms

Digital Immigrant. This term describes individuals born before 1980 (Prensky, 2001a). These individuals have not lived a life integrated with technology from an early age.

Digital Native. This term describes individuals born after 1980, for whom technology has been a constant presence and resource (Prensky, 2001a).

Meaningful Technology Integration. Louis (2012) refers to using technology for instruction, higher-order thinking, and educational practices, as well as strategies that engage and motivate not just students, but teachers as well. Meaningful technology integration is student-centered and gives all learners the opportunity to participate in the learning process.

Technology. This can include both hardware (including but not limited to computers, interactive white boards, document cameras, tablets, LCD projectors), software (programs, applications, site licenses), as well as supporting infrastructure such as networks, Intranet, Internet (Gray, Thomas, & Lewis, 2010).

Technology Integration. Technology integration is not simply the low-level use of technology in instruction, but when technology is used or employed to support, inspire, and create learning through higher-level use of technology (Cherry, 2014; Kotrlik & Redmann, 2009)

Procedures

This qualitative case study investigated the lived experiences of digital immigrant teachers identified as having meaningfully implemented technology in their classroom practices. I was seeking a deep understanding of the experiences of digital immigrant teachers and how their experiences influenced the implementation of technology in their teaching practices. A qualitative approach was taken for this study in order to investigate the experiences of digital immigrant teachers with depth and detail (Patton, 2002). A goal of this study was to understand the experiences of digital immigrant teachers and how they integrated technology despite living the majority of their lives without immersion in technology.

A qualitative approach was beneficial in determining common attributes or similarities shared by the participants (Patton, 2002). A qualitative lens had the advantage of being particularly constructed to delve deeply into a phenomenon in order to create a comprehensive view (Merriam, 2002). In addition, this qualitative lens can help construct an understanding of the meaning(s) digital immigrant teachers have

constructed about their implementation of technology into their teaching practices (Merriam, 2002), which in this case would be the patterns of adoption and meaningful integration of technology by digital immigrant teachers into their instruction.

A descriptive case study design was used with this research. A case study was chosen over a phenomenological or grounded theory due to the advantages of having a bounded system of digital immigrant teachers (Merriam, 2002; Stake, 1995). Maxwell (2005) supports a case study and bounded system when he states, "A case study…justifies the selection of a particular case in terms of the goals of the study and existing theory and research and needs a different kind of argument to support the generalizability of its conclusions" (p. 71). Whereas a grounded theory study would develop research questions throughout the course of the research, this case study investigated the stated research questions, in order to address the critical factors affecting digital immigrant teachers and their meaningful use of technology (Patton, 2002).

Purposive sampling was used as the desired method for choosing participants for this study. This method is ideal for researchers to intentionally seek out participants because of certain qualities who can further represent or offer insight to a given theory, in this case teachers who were digital immigrants (Bruce & Ewing, 2012). In order to gain a deep understanding of how digital immigrant teachers had integrated technology into their instruction, an invitation to participate in the study was sent out to digital immigrant teachers within specified school sysyem. Teachers who responded were asked to rank themselves on the LoTi "Sniff" Test. Teachers who self-ranked themselves on the LoTi "Sniff Test" in the 4-6 range were invited to participate in the study.

Three semi-structured interviews were conducted with each participant, following Seidman's (2006) interview protocol. Each interview served a specific purpose for the study. The first interview focused on each participants' life history as it related to technology. The second interview centered around the detail of the digital immigrants lived experience with teaching with technology. The third interview asked participants to reflect on the meaning of their experiences as a digital immigrant who teaches with technology. Before the interview, each participant was asked to review their self-ranking on the LoTi "Sniff" Test and given the interview questions. I followed an interview guide, but included additional questions for clarification and to gain in-depth descriptions from the participants. The interviews were transcribed by a trustworthy transcription service for analysis. The participating teachers were asked to perform a member check of the transcribed interviews, in order to ensure accuracy and that their responses indicate their intended meaning.

In addition to the interviews with participants, the researcher observed each teacher during instruction that includes technology integration. An observation guide was used to record objective and subjective observations. Each participant was asked to share the lesson plan for the lesson being observed. Student artifacts were not collected. After each observation, the researcher met with the participant to discuss the observation. This observation took place after the participant's second interview.

Significance of Study

According to the U.S. Census Bureau's 2012 Statistical Abstract, 2,792,000 public school teachers (excluding prekindergarten) in the workforce in the year 2008 were digital immigrants, as opposed to 612,000 public school teachers (excluding

prekindergarten teachers) who were digital natives. When considering the number of digital immigrants who are teaching a student population consisting of all digital natives, it is important to recall Nasah et al.'s (2010) findings indicating digital immigrant teachers may have a harder time connecting with digital native students. The results of this qualitative study to identify digital immigrants' efforts and challenges to integrate technology into the classroom could help improve technology integration with this population within the schools. While applications of results may be somewhat limited because of the purposive participant selection, it is possible the results may also assist or guide other systems of similar demographic size. An understanding of the factors affecting digital immigrant teachers' technology integration may lead to an increased use of technology integration when teaching digital native students.

Dervitsiotis (2007) reported the influx of new technology in the world of education has resulted in an increased demand to integrate technology into the classroom. While most classrooms are equipped with adequate technology, if a digital immigrant teacher is not using the available technology in a comprehensive and meaningful manner, students cannot reap the benefits of a 21st century classroom, where more student-centered, technology based activities are present. Therefore, the focus of this study was to identify the defining factors or beliefs that influenced digital immigrant teachers to meaningfully integrate technology into their instruction. Once results were analyzed, there may be a more focused view of defining moments or experiences which shaped digital immigrant teachers to meaningfully integrate technology.

The findings of the study can be used by teachers and administrators to shape future experiences and exposure to technology and technology training. Professional

development could then be conducted, in order to train other digital immigrant teachers in the meaningful implementation of technology. In addition, the results may assist administrators when they are planning and purchasing hardware, software, site licenses for their schools, and assigning and planning for personnel. It is common practice for administrators in the selected research site to look for input and advice from teachers on staff who are using technology frequently. The researcher's own school has a Technology Committee the principal formed, in order to help guide technology use and purchases.

By sheer logic and mathematics, it is evident the progression of time will result in the original digital immigrants (those born before 1980) moving out of the workforce and into retirement, while digital natives (those born after 1980) will comprise the population of the workforce, resulting in digital natives teaching digital natives. It is this researcher's theory, supported by Helsper and Eynon (2012), just as a second level of digital divide was identified, the rapid evolution of technology will result in a continued gap between teachers' technology use and that of their students and this will result in a second level of digital immigrants and digital natives. Heinz (2013), Wallace (2012), and Czaja et al. (2006) supported the concept of a second level based on the rapid rate of technology development, which often leaves behind individuals who do not work to adapt and adopt new technology. In a wider scale than local schools, the findings of this study may be used to identify the influences or factors that aid in overcoming barriers and shape technology integration, which can then be used to bridge this gap.

Author's Disclosure

Creswell (2009) examines the researcher's central and crucial role in qualitative research. Patton (2002) states unadulterated objectivity is not possible and the researcher must be transparent with bias. The main instrument in this study was the researcher, and as such, I must clarify bias, be trustworthy, and forthcoming. My 26 years of teaching have taken place in three schools, all classified as Title I schools. While I hold a teaching certificate for preschool through eighth grade, I have spent all of my teaching years in primary grades, primarily in the kindergarten classroom.

I am a digital immigrant classroom teacher, with bias about the importance of meaningful integration of technology in the classroom. While I believe students should be using technology integrated into all subject areas and the teacher is a facilitator and guide for students using technology, I have seen many colleagues who are also digital immigrants, who resist technology or avoid using it altogether. My own lived experiences are with fellow digital immigrant teachers who often fall behind when it comes to technology and their students miss out on learning opportunities because of this. Often, professional development concerning technology is not designed for digital immigrant teachers and is a wasted opportunity. My intention with this study was to identify the critical influences, factors, or beliefs that have led other digital immigrant teachers to integrate technology into their teaching practices, in order to be an agent of change for digital immigrant teachers who resist using technology.

Limitations of the Study

There were several limitations to this study. The scope of this study was limited to teachers and schools within two school systems. While the study did take place in two

different counties in the Southeastern region, which could add to the robust nature of the study, one county was considerably larger than the other, which could affect many factors, from available technology and support to quality of training offered to teachers. This school was in an urban area, with a high population of low socio-economic families and not inclusive of rural schools or schools with a higher socio-economic families. The smaller county had participants in middle school and high school and zero participants in elementary school, which may make it difficult to transfer the findings to similar settings. The selection of teachers was based on employment within the participating school districts, age, number of years teaching, and differing implementation of technology. While a case study approach allowed for a deep understanding and detail, limiting the study to a small number of participants and schools placed constraints on the research. More generalizable and comprehensive data could be collected if the study took place in an increased variety of geographical locations and grade levels. In addition, five of the six participants were female, which may make the transferability of this study limited.

It should be noted a single or small sampling does not allow for broad generalizations. However, Patton (2002) does allow for logical generalizations to be made with a single or small case sampling as is the case with this study.

Clearly, the meaningful integration and use of technology was influenced by the amount and type of technology available to teachers. This study was limited in that technology distribution is not the same for every teacher and every classroom. One of the school districts was a smaller district in the state, which limits generalizability to other districts which may be smaller or larger, in more rural or urban areas, or have restricted access to technology. In addition, not all students had the same access to technology

outside of the school arena, which could then affect their comfort level and acceptance of technology during instruction.

The participants were volunteers which could mean there was bias during self-reporting on the LoTi "Sniff" Test. Simply being willing to volunteer for the study may not be a true representation of digital immigrant teachers' technology integration. Hew and Brush (2007) caution a limitation of self-reporting is the participants answering with an idea of what is a socially desirable or acceptable responses or exaggerating their technology integration within their teaching practices. In an attempt to overcome this limitation, participants were assured of their anonymity within the study and we asked to choose the name used for them in the reporting of the findings.

My lack of previous case study research was a limitation to this study. My preconceived notions, subjectivity, and bias regarding the importance of technology integration may also have affected the lens through which the participants were viewed. The qualitative data may have been subject to my bias due to coding by only one researcher. Additionally, the period in which data collection occurred was from January to May. Given a longer window to collect data, additional common themes may have emerged, strengthening the analysis and results of the study.

Organization of the Study

This study was organized into five chapters. Chapter One includes a brief introduction to the study, the study's research questions, definitions of terms, overview of the methodology, the study's significance, as well as the limitations of the study. Chapter Two contains an in-depth literature review providing relevant background to the evolution of education and research related to the study. Chapter Three is the

methodology section. This chapter includes the research design, participants, instruments, procedures, and data analysis techniques. Chapter Four presents the results from the research study. The concluding chapter, Chapter Five, includes discussion and conclusions from the findings, while providing suggestions for future studies in this area.

Chapter II

LITERATURE REVIEW

The purpose of this study was to examine teachers as digital immigrants and the critical influences, factors, or beliefs that may have shaped them to accept and integrate technology. This study focused on the shift in the arena of education brought about by the ubiquitous presence of technology and how digital immigrant teachers have reacted to this. Included in the following literature review I provided the historical context for education in the United States, in order to gain an understanding of the extreme paradigm shift that has occurred in the past 40 years and the impact this may have had on digital immigrant teachers who are now teaching digital native students. In addition to the historical context, I discussed barriers to technology integration and digital literacy. To provide a better understanding of how digital immigrant teachers' experiences have affected their successful technology integration in their instruction, technology use in education was reviewed.

The Evolution of Education and Federal Reform in America

At its inception, public education in colonial America, while not organized into a formal system, was tasked with producing individuals who could read and write, with the goal of observing the laws of God and the state (Spring, 1997). After the American Revolution, it was believed public education should serve the expansive purpose of shaping good citizens who served the needs of not only society, but of government as well (Spring, 1997). Two noted historians, Ellwood Cubberly and Lawrence Cremin,

chronicled the progress and expansion of public education in the United States (Kelly, 2014). Kelly (2014) asserted while Cremin criticized Cubbelry for a too narrow view of education, both historians agreed public schools served the purpose of promoting democracy in America.

Ainsworth (2013) credited the American Revolution as an impetus for increasing America's increased importance in education, as the demand for skilled workers amplified. As the number of factory and agricultural workers dwindled and demand for knowledge workers increased, educational needs changed (Cherry, 2014). The 1900s brought sweeping change to the world of education and America emerged as a dominant leader in education (Ainsworth, 2013). Throughout the 1900s, high school attendance soared, the GI Bill made educational funding accessible to soldiers, Brown v. Board of Education resulted in the Supreme Court's ruling that segregation is inherently unequal, and the National Defense Education Act passed in response to the Soviet's launch of Sputnik (Ainsworth, 2013; Spring 1997).

In 1965 under President Lyndon Johnson, the Elementary and Secondary Education Act (ESEA) heralded the federal government's increased role in education as never seen before (Ainsworth, 2013; U.S. Department of Education, 1965). While Title II of ESEA provided funds for school libraries and preschool programs, Title III provided funds for supplemental educational centers. Spring asserted Title I as the most important section of ESEA, as the federal government provided funds for educational agencies involved in the needs of low-income children, with the intention of closing the skills gap in reading, writing, and math between children of poverty and children of middle class. Through ESEA the federal government shifted the focus in education from directing

youth into higher education, to a focus on providing equal opportunity to the economically disadvantaged, thus continuing President Kennedy's War on Poverty (Spring, 1997).

The next shift in educational reform occurred in the late 1970s and early 1980s, in response to concerns America was losing ground to foreign powers in areas of industry, commerce, and education. The Secretary of Education under President Reagan, T. H. Bell, created the National Commission of Excellence in Education (NCEE) in the summer of 1981. The commission of 18 members was comprised of men and women from backgrounds in education, the private sector, and government (U.S. Department of Education, 1983). The commission was given 18 months from the date of its first meeting to make a report to the Nation and the Secretary of Education, later named A Nation at Risk: The Imperative for Educational Reform (ANAR).

The NCEE was tasked with examining the state of education in America, determining obstacles plaguing the educational system, and to then address solutions for improvement (U.S. Department of Education, 1983). In order to accomplish this task the NCEE not only authorized research of the 41 documents summarized in the full report, but also held six public hearings across the United States during 1982 (U.S. Department of Education, 1983). While examining the educational system as a whole, the NCEE also focused on some specific issues (U.S. Department of Education, 1983). The ANAR report/document listed these specific areas as the quality of teaching and learning, not only in America's public schools, but private schools as well, and the commission would then compare American schools and colleges with those of advanced nations; student achievement in high school and college admissions; which educational programs had a

positive impact on student success in college; the impact of educational and social changes of the last quarter century on student achievement; and identifying which issues needed to be addressed and surmounted in order to return to excellence in education in America (U.S. Department of Education, 1983).

The commission stated their report should not only be viewed as a report to the Secretary of Education, but also as an open letter to the American people (U.S. Department of Education, 1983). The commission urged the American people, once properly informed by their report, to take the actions necessary not only for educational reform for their children, but for future generations, as well (U.S. Department of Education, 1983). The commission's concerns were not limited to education reform solely to strengthen our nation's presence in industry and commerce, but also to address the moral, spiritual, and intellectual strengths of our nation (U.S. Department of Education, 1983). The report consolidated 13 indicators of the risk facing the nation and its educational system (U.S. Department of Education, 1983). The indicators ranged from comparisons of American student achievement decreasing in many academic sectors with that of other industrialized nations, to complaints of military and business leaders of the need for costly remediation in basic skills just to bring their workforce to appropriate levels of performance. In contrast to previous generations, when the educational skills of each successive generation surpassed those before it, ANAR reported the average graduate of America's schools and colleges at that time were not as well educated as those graduates 25-35 years ago (U.S. Department of Education, 1983)

At the conclusion, the commission refined the extensive data gathered into four main aspects affecting the decline of America's education excellence. The first of these

was content or the curriculum (U.S. Department of Education, 1983). In regard to curriculum, the commission concluded secondary school curriculum lacked an axial design, where college preparation and vocational programs had been replaced with a more homogenized track of courses (U.S. Department of Education, 1983). At the time of the report in 1983, the percentage of students enrolled in a general program was 42%, as compared to 12% in 1964 (U.S. Department of Education, 1983). The commission believed this move away from college preparatory and vocational programs, in combination with increased student choice, impacted the nation's educational system in a negative manner (U.S. Department of Education, 1983). The second aspect the commission presented was expectations, which referred to the levels of skills, abilities, and knowledge secondary students and college graduates should possess, in addition to intrinsic motivators like self-discipline and motivation (U.S. Department of Education, 1983). A few of the deficits found within this aspect of the expectations included the creation of textbooks by publishers with few experienced scholars and teacher contributors, the comparison between industrialized nations' students, who are expected to take more than three times more math and science courses than students in America. Additionally, 26% of states allow 50% or more of the credits required for high school graduation to be electives, minimum competency exams have resulted in viewing the minimum as the maximum expectation, and 20% of all four year public colleges were required to accept all secondary student graduates, regardless of high school program of study or grades earned (U.S. Department of Education, 1983). The third aspect of the findings affecting America's educational process was time. The results revealed American students spent less time on school work compared to other nations, the time

spent in class and on homework is not effective, and America's schools were falling short in helping students acquire effective study skills in order to use time well or take the initiative to willingly put more time into their schoolwork (U.S. Department of Education, 1983). In contrast to other industrialized nations, American students spent two less hours a day and 40 less days a year in school, resulting in a deficit of 680 hours less schooling a year (U.S. Department of Education, 1983). The fourth aspect of the findings was in regard to the need for substantial improvement on teacher preparation programs, the quality of those entering the teaching profession, the working conditions of those currently in the profession, and the teacher shortage in key teaching fields such as math, science, foreign language, and special education (U.S. Department of Education, 1983).

The commission's recommendations for improvement fell into three categories: those which could be acted on immediately, those which could be implemented over the course of the next several years, and those which would result in lasting change (U.S. Department of Education, 1983). When addressing recommendations to content, the commission recommended strengthening high school graduation requirements at both the state and local levels, and giving minimum expectations in English, mathematics, science, social studies, and foreign languages for those students attending college. The commission identified English, mathematics, science, and social studies as the New Basics and when combined with foreign language, performing and fine arts, should be considered the building blocks of long-term success and crucial to school curriculum (U.S. Department of Education, 1983). The commission's recommendations for expectations focused on schools, colleges, and universities and their increased

expectations and requirements for admissions, with measurable and more stringent standards (U.S. Department of Education, 1983). One of the recommendations for executing these changes was the implementation of standardized testing at key transition points of schooling (U.S. Department of Education, 1983). The commission recommended these standardized tests as part of a nationwide system, involving both local and state standardized tests and should be one component used to assess and evaluate student progress (U.S. Department of Education, 1983). The commission's recommendations for time revolved around a significant increase of time spent on the New Basics, more effective use of the school day, longer school days or longer school years (U.S. Department of Education, 1983). Attendance policies were also suggested for implementation to decrease the amount of instructional time lost due to absences and tardiness (U.S. Department of Education, 1983). The commissions' recommendations for teaching were the most far reaching of all, consisting of seven parts, designed to improve teacher preparation and to make teaching a more respected and rewarding profession (U.S. Department of Education, 1983). The commission cautioned each of the seven recommendations should not be considered optional (U.S. Department of Education, 1983). The recommendations covered a wide range of issues in teaching, encompassing the improvement of teacher preparation programs, using master teachers to design these programs and supervise beginning teachers, increasing incentives to attract outstanding students to the career or teaching, and moving on to increasing teacher compensation, an 11-month contract, career ladders, and addressing teacher shortages in critical subject areas (U.S. Department of Education, 1983). While the commission's results identified four aspects of the educational process, they made a fifth recommendation regarding

leadership and fiscal support (U.S. Department of Education, 1983). This fifth recommendation urged citizens to hold both educators and elected officials responsible for leading the charge for reform and for citizens to provide the fiscal support necessary to institute the commission's proposed reforms. The commission cautioned the needed reform and implementation of recommendations could not be accomplished by schools and colleges unassisted, but must be a joint effort with policy makers, mass media, parents, and students, who must play a crucial role in reforming America's educational system (U.S. Department of Education, 1983).

According to Ainsworth (2013) and Guthrie and Springer (2004), A Nation at Risk catapulted the issue of education to the nation's attention. The report played a pivotal role in shifting a long-held system of local and state authority to an increase of the federal government's role in America's educational system (Ainsworth, 2013; Guthrie & Springer, 2004). In addition, it also resulted in federally imposed accountability measures that were dependent on student achievement rather than school funding (Guthrie & Springer, 2004). Ainsworth marked the report as being the catalyst for the involvement of corporate entities into the arena of education, as a quality education is now linked to providing corporations and the military with qualified candidates, thereby strengthening economic security.

While President Bush and President Clinton both introduced educational legislation or reform, none had the tremendous impact of President Johnson's Elementary and Secondary Education Act or President Reagan's A Nation at Risk. It was however, under President Clinton that the nation's first National Educational Technology Plan was introduced in 1996 and the emphasis on technology entered the political arena. The

technology plan, titled, "Getting America's Students Ready for the 21st Century: Meeting the Technology Literacy Challenge", was a report to the nation on the state of technology and education. President Clinton's Secretary of Education, Richard W. Wiley, prepared the report in response to Improving America's School Act of 1994 (U.S. Department of Education, 1996). In his June 1996 opening letter to Members of Congress, Wiley acknowledged while the use of technology has exploded in all aspects of life, most schools remain incapable of taking advantage of the learning opportunities technology affords (U.S. Department of Education, 1996). Echoing the sentiments of ESEA and ANAR, this resulted in the placement of students at a competitive disadvantage in the global marketplace (U.S. Department of Education, 1996). Also, tying in to ANAR's New Basics, the Secretary of Education refers to computers as the "new basic" of American education and to the Internet as the "backbone of the future" (U.S. Department of Education, 1996). This first ever national educational technology plan was centered around President Clinton's Technology Literacy Challenge (U.S. Department of Education, 1996). The Technology Literacy Challenge urged all the nation's students to become technologically literate by the beginning of the 21st century (U.S. Department of Education, 1996).

This challenge, while presented to the nation, was given with shared responsibility to local communities, states, parents, educators, the private sector, and the federal government (U.S. Department of Education, 1996). The report listed many of the benefits of technology use, which affected all the entities listed above: enhanced student achievement, basic skill instruction, advanced skill instruction, assessment of student progress, student motivation, increased family involvement, improved technology skills,

and improved school administration and management (U.S. Department of Education, 1996).

The Technology Literacy Challenge was comprised of four goals, with the purpose of creating a technologically literate student population by the beginning of the 21st century. The first goal was for every teacher in the nation to have, not just the training needed to help students learn using computers, but also the necessary support required to achieve this (U.S. Department of Education, 1996). The second goal of the Technology Literacy Challenge was for every teacher and student to have modern multi-media computers in their classrooms, as computers cannot be effective tools for instruction if they are not readily accessible by teachers and their students (U.S. Department of Education, 1996). The third goal hinged upon the second goal and stated all the nations' classrooms will be connected to the information superhighway (U.S. Department of Education, 1996). At the time of the report, only 9% of the nations' classrooms were connected to the Internet (U.S. Department of Education, 1996). The fourth goal differed from the first three goals as it addressed school curriculum and the integral part effective software and on-line learning resources should have in every schools' curriculum (U.S. Department of Education, 1996). The over-arching theme and focus of these four goals was laying a foundation of infrastructure and developing teachers' and students' technology skills.

When tackling the issue of the cost of meeting the four goals of the Technology Literacy Challenge, the plan stated while an accelerated investment is necessary, it is not possible to pinpoint a finite amount of the expenditure to achieve all four goals (U.S. Department of Education, 1996). It was cautioned schools must be prepared to have an

investment mentality and consider recurrent expenses, from hardware and software upgrades, to continued professional development for teachers and other school personnel (U.S. Department of Education, 1996). However, the plan did cite several cost analysis estimates. McKinsey and Company's 1995 cost analysis of meeting only the first three goals of the Technology Literacy Challenge was at $109 billion over 10 years (U.S. Department of Education, 1996). A second cost analysis by the RAND Corporation gave an estimate between $8 billion and $20 billion per year over five years. A third analysis by Telecommunications Industries Analysis Project was given with $10 billion to $12 billion a year over five years (U.S. Department of Education, 1996). These three estimates represent a range three to six times the amount being spent on purchasing and supporting the use of educational technology in schools at that time (U.S. Department of Education, 1996).

While overall cost was a challenge in reaching the national technology goals, the plan listed an additional challenge as ensuring no community is left behind in the implementation and use of technology (U.S. Department of Education, 1996). The term digital divide was used to explain the disparity between middle-and-upper-middle-class income homes and schools and low-income homes and schools (U.S. Department of Education, 1996). The plan discussed the federal government's role in closing the digital divide and listed several avenues for increased funding for technology in low-income communities, where schools often lack the infrastructure necessary for technology use, the hardware, software, Internet access, and funds for teacher training (U.S. Department of Education, 1996).

As was seen in ANAR, the plan closed with a call to the nation to, once again, work together to move all students to a point of digital literacy by the early 21st century (U.S. Department of Education, 1996). The emphasis was on the leadership roles which must be assumed by not only the federal government, but local and state communities as well, which have the most at stake in the Technology Literacy Challenge (U.S. Department of Education, 1996). The federal government did take steps to ensure funds earmarked for technology in the 1997 budget could be received only if certain conditions were met by states (U.S. Department of Education, 1996). There was flexibility to receive the funds, as states were at different stages of implementation. To receive the funds, each state would develop a strategy outlining the plan for meeting the four goals in every school in the state (U.S. Department of Education, 1996). The strategies from the states had to incorporate private sector participation. This participation must equal at least half the amount of federal support (U.S. Department of Education, 1996). In order to address state accountability of the first two requirements, states were required to set benchmarks. These benchmarks must then be publicly reported at the end of every school year. The report had to include the progress made in the achievement of said benchmarks, as well as how to fully achieve all objectives in the most cost-effective manner possible (U.S. Department of Education, 1996).

After the first national educational technology plan in 1996, the Office of Educational Technology (OET), a department within the Department of Education, continued to release a national educational technology plan in 2000, 2004, 2010, and 2016. The goal of the OET is to develop national technology policy and provide a vision

for the nation of the role technology can play in transforming teaching and learning throughout all stages of education (Office of Educational Technology, n.d.).

The 2000 national educational technology plan, titled "e-Learning: Putting a World-Class Education at the Fingertips of All Children" continued and expanded the focus of the 1996 national technology plan (U.S. Department of Education, 2000). In his opening letter to Members of Congress, Secretary of Education, Richard Wiley, commented on the tremendous progress made toward reaching the goals of his first national technology plan and how access to computers and the Internet had increased for many of the nations' schools and teachers (U.S. Department of Education, 2000). This progress was attributed to increased investment in technology for education from federal, state, local, and private sectors (U.S. Department of Education, 2000). These investments spanned a range from tangible items, such as hardware to conceptual items such as professional development for teachers (U.S. Department of Education, 2000). The 2000 plan listed five new national goals focused on the importance of providing digital content and instruction and how it can transform teaching and learning, the effective use of technology to help students achieve high standards, the importance of research and evaluation's crucial role in improving technology for both teachers and students, and the role of e-learning (U.S. Department of Education, 2000).

The first goal of the 2000 National Educational Technology Plan expanded the 1996 plan, in that it broadened the scope of access to technology for teachers and students from not only classrooms and schools, but to communities and homes as well (U.S. Department of Education, 2000). This goal did not singularly address access, but encompassed the quality of the Internet access, with Broadband becoming the new

standard (U.S. Department of Education, 2000). The second goal addressed teachers using technology effectively for students to reap the benefit of high achievement (U.S. Department of Education, 2000). The third goal stated all students will have technology and ICT skills and spoke to the increasing priority being placed on participation in the highly technical global workforce (U.S. Department of Education, 2000). Emphasis was given to the importance of integrated skills, along with problem solving, rather than an isolated set of skills or a checklist (U.S. Department of Education, 2000). The plan referred to this combination of skills as "21st century literacy" (U.S. Department of Education, 2000, p. 6). The fourth goal of the plan pushed research and evaluation's role to the forefront to improve technology for teaching and learning (U.S. Department of Education, 2000). A systematic agenda for research and evaluation was urged to continue technology applications for teaching and learning (U.S. Department of Education, 2000). The fifth goal underscored the importance of digital content and networked applications and their crucial role in transforming teaching and learning (U.S. Department of Education, 2000). The plan cautioned digital content and networked applications must be scrutinized for quality, availability, and ease of use (U.S. Department of Education, 2000).

For each of the five goals of the 2000 National Educational Technology Plan, recommendations were made to meet the goals. As seen in ANAR, and the 1996 national educational technology plan, these recommendations were addressed to the nation as a whole, from the federal government, down to local communities and schools (U.S. Department of Education, 2000). When addressing universal access to educational technology for teachers and students, the plan's first goal, emphasis was placed on the

importance of sustained and predictable funding, the crucial aspect being local plans not only reflect the educational needs of the students, but are also regularly updated, the need to improve affordability, reliability, and ease of use of the educational technology chosen, keeping school structures updated, eliminating the digital divide in communities, and guarantee all students have equal opportunities to access and use of the educational technology available (U.S. Department of Education, 2000). To successfully meet the second goal, the plan addressed the importance of comprehensive education in educational technology for pre-service teachers, increasing both the quantity and quality of professional development for teachers in the classroom, and improving the instructional support structure for teachers using technology (U.S. Department of Education, 2000). Recommendations for the third goal centered on the types of skills students will need in local and state standards, guaranteeing students are using technology appropriately, as well as responsibly, developing new assessment tools to be used with students, and strengthening relationships with industry in order to meet the future demands of the workforce (U.S. Department of Education, 2000). Research and evaluation recommendations centered around a systematic agenda used to research and evaluate technology applications for teaching and learning, ensuring local and state agencies evaluate technology programs, and ensuring the research-based information available is disseminated to those using the technology (U.S. Department of Education, 2000). The recommendations for the fifth goal began by addressing the importance of not just administrators being technologically literate, but policy makers as well (U.S. Department of Education, 2000). In addition, the plan urged communication across and within sectors, identifying leadership opportunities afforded by technology, expanding

efforts to bring rich educational materials into the digital world, and removing barriers which hinder the purchase of digital content and networked applications (U.S. Department of Education, 2000). It was the goal of this plan to keep educational technology at the forefront of the nation and to continue the remarkable progress seen since the introduction of the 1996 plan, with the goal of enhancing and improving student achievement (U.S. Department of Education, 2000).

In the midst of the release of national educational technology plans, a set of technology skills and standards was introduced as the National Educational Technology Standards (NETS) (Ainsworth, 2013; ITSE, 2002; Roblyer, 2000). The International Society for Technology in Education (ISTE) published NETS in an effort to set national technology standards for students (ITSE, 2002; Roblyer, 2000). The first version of NETS was introduced in 1998 and focused on student technology standards, with updated standards released to include teachers in 2000, and administrators in 2001 (ITSE, 2002). There have been periodic reviews and re-releases over time as ISTE has made revisions (Ainsworth, 2013; Howland et al, 2012; ITSE, 2002).

Shortly after the 2000 National Educational Technology Plan was released, a major educational reform law, under President George W. Bush, was enacted (NCLB, 2002). This law, known as No Child Left Behind (NCLB) was an update to President Johnson's Elementary and Secondary Education Act of 1965 (NCLB, 2002). Once again, the nations' leaders were concerned with America's educational system and its failure to produce students who were able to compete in the international marketplace (NCLB, 2002). NCLB increased the federal footprint in America's K-12 educational system by increasing the federal government's role in accountability for high achievement for all

students by establishing measurable goals (NCLB, 2002). Students would now need to achieve state established standards on qualifying exams in order to be deemed proficient (NCLB, 2002). Special focus was placed on increasing performance of certain populations, such as students with disabilities, English second language learners, and minority students (NCLB, 2002). The law mandated testing in grades 3-8 and once in high school in both reading and math (NCLB, 2002). States were required to report testing results and all students were expected to be proficient on state tests by the 2013-14 school year (NCLB, 2002). As it relates to the present study, NCLB, Part D, Enhancing Education Through Technology, concentrated on the use of technology in schools (NCLB, 2002).

The main purpose of Part D was to give states and localities assistance implementing technology, with the end result of improved student achievement, as well as set a standard of digital literacy at the completion of 8th grade (NCLB, 2002). The standard for digital literacy was created by the U.S. Department of Education and ISTE (NCLB, 2002). While states were not required to have a technology plan, in order to receive federal funding, states had to have a plan approved by the federal government and said plan must include how the state will meet the requirements of Part D (NCLB, 2002). There were 15 requirements for a state technology plan, including, but not limited to: the state's long-term strategy for using technology to improve student achievement, how the plan incorporated teacher education, how the state would provide technical assistance to children in poverty, and how the state would use technology to increase parental involvement (NCLB, 2002).

NCLB was one of the crucial influences in the development of the 2004 national educational technology plan (U.S. Department of Education, 2004). In the opening letter to Members of Congress, Secretary of Education, Rod Paige, mentioned NCLB twice, as well as a third time in the Executive Summary, giving credence to the major influence NCLB held in the development of this third national technology plan, *Toward a New Golden Age in American Education: How the Internet, the Law and Today's Students Are Revolutionizing Expectations* (U.S. Department of Education, 2004). In this plan, the emphasis shifted from goal setting to a student-oriented approach, presenting a systematic approach to transforming education through technology (U.S. Department of Education, 2004). It was reported in the plan that while educational technology is thriving as an entity, this was not the case within our nations' schools and the promise of technology had not been realized in education (U.S. Department of Education, 2004). While students were mastering the Internet, this was in part not due to experience at school, where computers were often underused and improperly maintained, but happening at home (U.S. Department of Education, 2004). It was asserted in the plan that students, regardless of age, have surpassed their teachers in computer literacy and the imperative need for systematic change, where teachers and students work together as partners to explore what can be accomplished through technology (U.S. Department of Education, 2004). The plan outlined the increased investment spent in the educational arena, with little return, as reading scores remained steady over a 20-year period (U.S. Department of Education, 2004). The call was made for walls to be torn down, both physically and philosophically, with the intended result of seeing and embracing change (U.S. Department of Education, 2004). It was reported five states had successfully broken

down the restrictive walls of compartmentalized approaches to technology and transformed teaching and detailed seven states that had state initiatives designed to implement and support change (U.S. Department of Education, 2004).

As previously stated, the 2004 plan deviated from previous national educational technology plans in that it did not list goals, but rather chose a total of seven action steps and recommendations (U.S. Department of Education, 2004). In addition, it deviated from previous plans by considering student input. Through a partnership between NetDay and the Department of Education, 210,000 K-12 students were able to give input through an online survey during their schools' participation in NetDay's Speak up Day in 2003, (U.S. Department of Education, 2004).

The first action step served as the foundation for all the other action steps and was strengthening leadership in order to have knowledgeable and technologically savvy leaders who could then inform a systematic change (U.S. Department of Education, 2004). Recommendations for this action step ranged from leadership development programs to training in technology decision making, as well as student participation in the planning process (U.S. Department of Education, 2004). The second action step, consider innovative budgeting, encouraged reallocation and restructuring budgets (U.S. Department of Education, 2004). Improving teacher training was the third action step, with recommendations echoing the 2004 national technology plan, such as improving preparation of pre-service teachers, improving the quantity and quality of teacher training, although there was a new emphasis on ensuring the availability of online learning courses for teachers and the use of data to personalize instruction (U.S. Department of Education, 2004). The fourth action step, support e-learning and virtual

schools, focused on the considerable growth in e-learning and virtual schools, with recommendations that included providing access to e-learning to every student, as well as giving every teacher the opportunity to participate in e-learning training (U.S. Department of Education, 2004). Encouraging Broadband access, that is properly maintained, was the fifth action step, with recommendations to make this available to teachers and students 24 hours a day, 365 days a year (U.S. Department of Education, 2004). The sixth action step focused on a move toward digital content and away from traditional textbooks, with recommendations covering training for teachers and students in the use of digital content (U.S. Department of Education, 2004). Recommendations for the seventh action step, integrating data systems, encouraged the development of a plan to integrate data systems in order to positively impact student learning and increase efficiency (U.S. Department of Education, 2004). The seventh action step was seen as crucial in the allocation and management of resources (U.S. Department of Education, 2004).

In the opening letter to Members of Congress in the 2010 national education technology plan, the Secretary of Education, Arne Duncan, urged this plan to be viewed as a vision by which education in American can be transformed (U.S. Department of Education, 2010). *Transforming American Education: Learning Powered by Technology*, encouraged educators to use technology to power a 21st century model of learning by focusing on five cardinal components of technology powered learning (U.S. Department of Education, 2010). The plan acknowledged the central role technology plays in virtually every aspect of daily lives and work and urged the use of technology to leverage powerful and engaging learning experiences for students (U.S. Department of Education,

2010). This plan, like the 2004 national educational technology plan, emphasized the importance of research to identify best practices in technology use in teaching and learning (U.S. Department of Education, 2010).

The first essential area addressed by the 2010 plan was learning (U.S. Department of Education, 2010). The vision was engaging, relevant, personalized, powerful learning for all students, that would occur both in and out of school, to prepare students to be participants in a global networked society (U.S. Department of Education, 2010). Recommendations for meeting the first component included revised, and possibly new, standards where technology was infused in all content areas and the development and use of learning resources that take advantage of the flexibility, availability, and power of technology, (U.S. Department of Education, 2010).

The second component, assessment, touched on the important changes that must be made to assessments to leverage technology, with the purpose of streamlining and facilitating the assessment process (U.S. Department of Education, 2010). The results of assessment should then be used for continuous and improved learning outcomes (U.S. Department of Education, 2010). Recommendations continued to echo those of national educational technology plans from previous years when recommending the need to train and support educators as they implement and manage the assessment process (U.S. Department of Education, 2010). Recommendations also included the importance of the timeliness of feedback from assessments, the importance of research into embedded assessments to engage and motivate leaners while they are being assessed, and research into the Universal Design for Learning (U.S. Department of Education, 2010).

The third essential component of the plan, teaching, called for a shift in the paradigm of the teachers' role (U.S. Department of Education, 2010). The teacher would now be considered part of a teaching team, connected to not only colleagues, but also students, parents, and community members; a concept the plan identified as connected teaching (U.S. Department of Education, 2010). Isolated and ineffectual professional development would be replaced by professional learning that supported the collaborative effort, with a blend of in person and online environments (U.S. Department of Education, 2010). Further emphasis was placed on diminishing the knowledge gap shown by teachers, administrators, and educational policymakers in technology understanding, as compared to professionals in other sectors (U.S. Department of Education, 2010).

This knowledge gap was viewed as a roadblock to the use of technology to improve instructional practices and learning outcomes (U.S. Department of Education, 2010). Recommendations for this component touch upon teachers' access to technology tools and resources, and the use of social networking technologies, and increasing teachers' digital literacy (U.S. Department of Education, 2010). The fourth component, infrastructure, encompassed the concept all teachers and students would have access to the resources needed, when and where they are needed (U.S. Department of Education, 2010).

Infrastructure was deemed essential to accomplish connected teaching and learning (U.S. Department of Education, 2010). Recommendations not only included ensuring teachers and students had access to broadband, as was seen in past technology plans, but the new standard of wireless connectivity, both in and out of school was recommended (U.S. Department of Education, 2010). It was also recommended that

teachers and students alike have at least one device capable of internet access and multimedia content for use both in and out of school (U.S. Department of Education, 2010).

The final component in this plan, productivity, urged the nation to reconsider basic assumptions of America's educational system, with the end goal of transforming American education (U.S. Department of Education, 2010). There were also some traditional assumptions to be addressed as needing a change: that of time-based measures, separating students by age-groups, separate structured academic disciplines, equal sized classes, and lock step content and curriculum (U.S. Department of Education, 2010). As seen in previous plans, educators and policymakers were encouraged to look to other sectors that have successfully leveraged technology to improved productivity (U.S. Department of Education, 2010).

The 2016 national educational technology plan, *Future Ready Learning: Reimagining the Role of Technology in Education*, while sharing similarities with the 2010 plan, is distinct in its format; this is the first national educational technology plan to be available online, rather than a printed document, nor does it begin with the Secretary of Education addressing the Members of Congress (U.S. Department of Education, 2016). The introduction to the plan stated it is a call to action, a vision for learning enabled via technology, as well as a collection of real-world experiences and recommendations, crafted for teachers, administrators, teacher preparation professors, and policymakers, to make everywhere, all-the-time learning possible (U.S. Department of Education, 2016). Technology accessibility and equity are essential components of this plan (U.S. Department of Education, 2016). While achieved progress in leveraging

technology to transform learning is noted from the 2010 plan, it was stated that much work remains to be done, as a digital divide exists in the use of technology. In addition, research continued to be limited, there are still schools not using technology to improve learning, teacher preparation programs and professional development are not prepared for effective technology use. Assessment had not evolved to its full potential and schools faced a growing dilemma of protecting students' privacy in the midst of using data to personalize learning (U.S. Department of Education, 2016).

The plan consisted of five sections, sharing four of the five components of the 2010 plan: learning, teaching, administration, assessment, and infrastructure (U.S. Department of Education, 2016). In regard to the component of learning, the plan emphasized the importance of learning experiences that are both formal and informal and prepare students to be part of a globally connected society (U.S. Department of Education, 2016). No longer are students' educational opportunities limited to the physical structure of their schools, as technology can be leveraged to enable those learners to take advantage of resources for personal learning far beyond their classroom walls (U.S. Department of Education, 2016). In addition, the plan touched upon the importance of students learning how to build non-cognitive competencies, which encompass social and emotional learning, self-management, and social awareness (U.S. Department of Education, 2016). One of the core concepts under learning was introduced in the 2010 national educational technology plan, Universal Design Learning (UDL), which is based on an architectural principle of universal access to physical spaces (U.S. Department of Education, 2016).

UDL in education focuses on the concept of universal access to learning (U.S. Department of Education, 2010, 2016). In UDL, information is presented through multiple means, whether digital books, websites, or specific software (U.S. Department of Education, 2016). Multiple means of expression are accepted in order for students to demonstrate what they know (U.S. Department of Education, 2016). This could be through a written platform, concept mapping, or for students with a disability, speech-to-text programs (U.S. Department of Education, 2016). In UDL multiple means of engagement are employed to motivate and stimulate students (U.S. Department of Education, 2016). Digital learning tools can be leveraged with all three principles of UDL (U.S. Department of Education, 2016). Recommendations for learning include implementing UDL.

Teaching with technology, the second goal of the plan, required teachers receiving support from their schools to not only access technology, but to receive support in learning how to use that technology effectively (U.S. Department of Education, 2016). Particular emphasis was placed on the role of teacher preparation programs and in-service professional development and the important role they must play in ensuring teachers are proficient in selecting and using technology for student engagement (U.S. Department of Education, 2016). Further building on 2010's goal and recommendation for connected teaching, the 2016 plan emphasized that as students are no longer confined to the physical school building, neither are teachers (U.S. Department of Education, 2016). This allows teachers to expand their experiences and perspectives by leveraging technology to create effective and dynamic learning experiences for their students (U.S. Department of Education, 2016). Recommendations for teaching included increasing

digital literacy professional learning experiences for pre-service and in-service teachers, developing a teaching force prepared for blended, as well as online instruction, and developing common technology competency expectations for teachers, whether this is at the university level or first year teachers (U.S. Department of Education, 2016).

The third goal, leadership, encouraged leaders in education to create a shared vision of technology as an avenue for student engagement and success (U.S. Department of Education, 2016). Though the plan acknowledges the importance of leadership in technology implementation through all levels of education, it is noted to be particularly crucial in public schools PK-12 (U.S. Department of Education, 2016). Leaders hold the reins to professional learning funds and as such, must place the necessary importance on the quality and quantity of the professional development available to teachers (U.S. Department of Education, 2016). In addition, it is leaders who must have a strategic implementation plan for meaningful technology implementation and commit the financial resources necessary to accomplish this goal (U.S. Department of Education, 2016). Recommendations for leaders included eliminating and/or reducing existing costs, establishing communities of practice, setting a vision for the use of technology, and involving stakeholders in that vision and planning (U.S. Department of Education, 2016).

Assessment, also a key component of the 2010 plan, should be technologically based, embedded, and improved to measure what matters and to then use this data to improve learning (U.S. Department of Education, 2016). The plan envisioned the future of assessments to be universally designed, to allow access for all, including students with disabilities, to be adaptive, and with real-time feedback, to use the feedback for a greater impact to support teaching and learning (U.S. Department of Education, 2016).

Recommendations for learning included next generation tools to integrate across platforms and ensuring all involved have a firm understanding of security and privacy (U.S. Department of Education, 2016).

When discussing infrastructure for teachers and students, several components were listed as essential to building a robust infrastructure: persistent access to the Internet both in school and out, access to powerful mobile devices to connect to the Internet, digital content that is of high quality, and guidelines to ensure students are safe (U.S. Department of Education, 2016). The infrastructure should be designed to support learning everywhere, all-the-time learning, with consistent and reliable connectivity (U.S. Department of Education, 2016). Recommendations included ensuring teachers and students have broadband access outside of school, support of open licensed educational material, and the creation of sustainability plans (U.S. Department of Education, 2016).

As the national educational technology plans have been introduced, they have brought the importance of technology in education to the nation's attention. As the plans have evolved, they have carried common themes and have continued to stress digital literacy and the need for an instructional shift in education (U.S. Department of Education, 2016). Technology presence continues to grow and America's education system must embrace it and decide how it should be used, not whether or not is should be used, in order to leverage it for student engagement (U.S. Department of Education, 2016).

Barriers to Technology Implementation

With the national emphasis turning toward technology and its burgeoning use and role in all areas of daily life, Ertmer (1999) explored barriers to teachers' technology use

and what changes needed to occur in order to facilitate the use of technology. Ertmer (1999), echoing the ideologies addressed by federal educational legislation reform and the first national educational technology plan, asserted education in general, and teachers and their technology use specifically, had changed very little, despite recognizing the importance of integrating technology into the curriculum. Ertmer acknowledged most teachers were quick to recognize the importance of technology integration, yet faced many roadblocks or barriers. Expanding on Brickner's (1995) concept of first-and second-order barriers to change, Ertmer (2005) discussed first-order barriers and second-order barriers to technology integration. Ertmer affirmed the importance of teachers' awareness of the barriers they may face when integrating technology, in order to develop the strategies and skills necessary to overcome them.

When defining technology integration, Ertmer (1999) took care to emphasize a picture that encompassed not only a curricular aspect, but a future view aspect as well. Technology integration could enhance the curriculum by adding value with some less important quantitative changes that increase efficiency, but more importantly, with qualitative changes that accomplish complex and authentic goals (Ertmer, 1999). Ertmer cautioned against using quantitative numbers (number of computers, number of technology personnel, number of hours logged on to a server) to define integration, instead seeing technology integration as determined by how technology was being used to further teaching and learning by both teachers and students. What is being accomplished with technology when implemented was more important than the kinds or types of technology used to accomplish complex and authentic goals (Ertmer, 1999).

Ertmer (1999) reported barriers to technology integration were common, even among those considered to be exemplary users. First-order barriers to technology integration were defined as those obstacles considered extrinsic to the teacher (Ertmer, 1999). First-order barriers, considered easy to measure and eliminate given enough money, fall into the category of resources (Ertmer, 1999). Examples of these barriers would be physical equipment/hardware, training, support, and time (Ertmer 1999). These may be barriers because they are missing altogether or not provided adequately in teachers' implementation environment (Ertmer, 1999). Early integration efforts focused on eliminating first-order barriers, with the assumption that adequate resources would result in integration (Ertmer, 1999). This barrier often came with a lock-step mentality that technology integration would not occur until all necessary resources were in place (Ertmer, 1999). First-order barriers, often viewed as simultaneous, could be perceived as overwhelming (Ertmer, 1999). It was found reducing or eliminating first-order barriers allowed second-order barriers to become more apparent (Ertmer, 1999; Hew & Brush, 2007; Pelgrum, 2001).

Ertmer (1999) identified second-order barriers as those rooted in teachers' underlying attitudes or beliefs about teaching and learning that may hinder or inhibit fundamental change. Second-order barriers, unlike outwardly apparent first-order barriers, are more indeterminate and as such, teachers and others may remain unaware of their existence (Ertmer, 1999). Research reported teachers experiencing second-order barriers may impede technology implementation more than first-order barriers (Ertmer, 1999). Possible reasons for the stronger effect of second-order barriers were due to their deeply ingrained, personal, and nebulous nature (Ertmer, 1999). Ertmer conceded not all

technology integration required the removal of second-order barriers, such as technology used to automate existing practice, however technology integration involving a qualitative shift to accomplish complex and authentic goals would necessitate the removal of second-order barriers. A shift in the teachers' and students' role and style from a traditional environment is required if technology is to be meaningfully and successfully integrated (Ertmer, 1999).

Ertmer (1999) discussed the apparent importance of teachers' perceptions in the significant difference between high and low-level technology uses. Teachers' perception of the relative weight of first-order barriers could result in different consequences or classroom outcomes (Ertmer, 1999). While second-order barriers are not observable or quantifiable, they may impact the reason teachers give for feelings of frustration with first-order barriers (Ertmer, 1999). Ertmer recommended the need for further research into the relationship between first-and second-order barriers.

After barriers have been identified, the next step would be implementation of strategies to overcome the barriers (Ertmer, 1999). When discussing strategies, Ertmer (1999) asserted one of the more important steps to be taken is the development of a vision of how to implement technology in order to achieve complex and authentic goals. As echoed in A Nation at Risk (U.S. Department of Education, 1983) and later in national educational technology plans (U.S. Department of Education, 2000, 2004, 2010, 2016), Ertmer (1999) reinforced this vision should be shared among all stakeholders and not teachers alone. After a vision has been crafted, specific curricular areas where technology can work must be identified, resources must be obtained, and then managed (Ertmer, 1999). Ertmer called for significant changes in professional preparation of

teachers, as they will be more likely to successfully overcome first-and second-order barriers if they are aware of them.

Following Ertmer's (1999) research, Pelgrum (2001) reported on a study conducted by the International Association for the Evaluation of Educational Achievement that used a school survey, consisting of responses from lower and secondary schools in 24 countries. One section of the survey gave school principals and school technology experts a list of 38 potential obstacles to technology implementation and asked respondents to indicate if each of these were major obstacles in realizing the schools' computer-related goals for students (Pelgrum, 2001). The results of the survey indicated the most frequently mentioned obstacle to be one of Ertmer's first-order, or external barrier, of insufficient number of computers (Pelgrum, 2001). The second most frequently mentioned obstacle was a second-order barrier, or internal barrier, of teachers' lack of knowledge and skills in regard to ICT (Pelgrum, 2001). In the top 10 obstacles were several other first-and second-order barriers, such as lack of Internet access, insufficient software, lack of technical assistance, insufficient teacher time, and lack of training opportunities (Pelgrum, 2001).

By 2005 reports suggested many schools and teachers experienced the removal of first-order barriers (Ertmer, 2005). Ertmer reported the U.S. Department of Education's 2003 data indicated no significant differences in computer availability by poverty level or school type and 81% of teachers had high to moderate levels of access to instructional computers. In addition, the same data reported 85% of teachers felt moderately well-prepared to use technology in their classroom instruction, which was an increase from 53% from 2000. Yet, despite increased access to technology, favorable policies (ISTE

Standards, No Child Left Behind, national educational technology plans), and increased training for teachers, high-level technology use by teachers remained low (Ertmer, 2005). The reduction or removal of first-order barriers resulted in increased technology use for instructional purposes, but it was teacher-centered and low-level (Ertmer, 2005).

While Ertmer (2005) suggested the increased low-level use could be due to a gradual increase in use and proficiency (from low-level use building to high-level use), and not enough time had lapsed to see more growth, to delve further into the subject, the relationship between teachers' pedagogical beliefs and their technology practices were examined. Although previous research examined the influence of teachers' pedagogical beliefs on their classroom practices related to the teaching of science, literacy, and mathematics, Ertmer stated few studies had examined the relationship between teacher beliefs and technology adoption. Ertmer focused on teachers' educational beliefs not only about teaching and learning, but also how the beliefs teachers have about technology transfer to their instructional practices. Ertmer theorized, extrapolating from theory of how beliefs are formed, that teachers at this time would have limited experiences with the use of technology in their own schooling, and would therefore be unlikely to have a plethora of preconceived ideas regarding how technology can best be used to accomplish student learning, but would respond as they had to other new instructional situations, by relying on previous experiences and beliefs.

If teachers were using technology for low-level use, despite a decrease in first-order barriers, the question on how to change these beliefs must be asked (Ertmer, 2005). Ertmer (2005) expounded on three strategies for promoting change in teachers' beliefs about teaching and learning technology. The first strategy centered around teachers'

personal experiences with technology and starting with simple uses to build increased high-end uses, in combination with explicit belief exploration and examining new practices that are supported by differing beliefs (Ertmer, 2005). The second strategy to change teacher beliefs about the use of technology was using vicarious experiences to build technology confidence and competence (Ertmer, 2005). Seeing others successfully utilize technology for high-level use may increase teachers' perceived need for change and that such change is attainable (Ertmer, 2005). In addition, vicarious experiences can introduce teachers to others who can support and challenge them as they modify their instruction and implement technology in their classrooms (Ertmer, 2005). Social cultural influences, the third strategy suggested by Ertmer, relies on professional learning communities and social networks to support risk-taking and transformation of teaching practices. The socialization by peers to regard technology use differently can result in change in teacher beliefs (Ertmer, 2005). Ertmer urged a combination of these three strategies with explicit conversations about pedagogical beliefs, small supportive communities of peers who desire transformation of their teaching practices, the gradual introduction of technology tools, and technical pedagogical support that is ongoing to begin and support change in teachers' technology practice.

Following Ertmer's lead, Hew and Brush, (2007) conducted a meta-analysis to identify and examine barriers to successful technology integration into the curriculum in K-12 schools, not only in the United States, but in other countries as well. The 48 studies analyzed ranged from 1995 to 2006 (Hew & Brush, 2007). From these studies, a total of 123 barriers were identified, which were then classified into six main categories (Hew & Brush, 2007). The categories were a combination of first-and second-order barriers and

were listed in relative frequency in which they were found in the studies reviewed (Hew & Brush, 2007). Resources, the first and most frequently found barrier in the analysis, was a first-order barrier, which was at odds with national educational technology plans (U.S. Department of Education, 2000, 2004) and Ertmer's (2005) statement that access to technology had greatly increased (Hew & Brush, 2007). The second most frequently occurring barrier, knowledge and skills, was a second-order barrier (Hew & Brush, 2007). Hew and Brush pointed out that this does not exclusively refer to technology skills (i.e. knowledge of software/programs, etc) which was one of the most common reasons given for not using technology, but also technology related to classroom management and technology supported pedagogical knowledge. Institution, the third category of barriers, was also a first-order barrier (Hew & Brush, 2007). Institutional barriers included factors external to teachers, such as leadership, a school's timetable structure, and school planning (Hew & Brush, 2007). The second-order barrier of attitudes and beliefs, the fourth category identified by Hew and Brush, supported Ertmer (2005) in that teacher attitudes and beliefs toward technology determine technology use in teaching and learning. Assessment, the fifth category of barriers, was a first-order barrier (Hew & Brush, 2007). This barrier was two-fold in that teachers felt more material, which would then be assessed, could be covered in whole group, lecture formats, than with spending the time required to plan lessons covering the same material with technology integration, as well as the shift of using technology for assessment, not just teaching and learning (Hew & Brush, 2007). The sixth and final category, subject culture, was a first-order barrier (Hew & Brush, 2007). Subject culture referred to the reluctance teachers may feel regarding the integration of technology into subjects that do

not seem compatible with technology (i.e. an art teacher who believes students should paint in a traditional manner, rather than a computer mouse) (Hew & Brush, 2007).

Further, Hew and Brush (2007) stated although the six categories of barriers were detailed individually, they were all interrelated. Technology integration was shown to be directly influenced by these four barriers: teachers' attitudes and beliefs toward technology use, teachers' knowledge and skills, the institution, and resources (Hew & Brush, 2007). In addition, technology integration was shown to be directly influenced by both subject culture and assessment (Hew & Brush, 2007).

Hew and Brush's (2007) suggested strategies to overcome barriers, while more numerous than Ertmer's (1999) strategies, had several commonalities. The first strategy Hew and Brush (2007) suggested was one Ertmer asserted to be one of the most important steps, having a shared vision of technology and developing a technology integration plan. Hew and Brush's (2007) second strategy overcoming the scarcity of resources, which also tied into Ermter's strategies for overcoming barriers. Hew and Brush's (2007) third strategy, changing attitudes and beliefs, again aligned with Ertmer's earlier recommendations for overcoming barriers. Professional development, Hew and Brush's fourth strategy, matched with Ertmter's as well, as Ertmer called for significant change to the professional preparation of teachers. One strategy recommended by Hew and Brush (2007) which was not suggested by Ertmer, was reconsidering assessment. Hew and Brush (2007)urged for either assessment to be completely reconsidered when technology is integrated or to use technology to meet the demands of standards-based accountability measures.

When researching technology barriers to integration in mathematics, Wachira and Keengwe's 2011 findings further supported Ertmer (1999, 2005), Pelgrum (2001), and Hew and Brush (2007). This mixed method study investigated urban teachers' perceptions of the barriers that impeded technology use in the content specific area of mathematics. The sample for the study was small: 20 teachers who were enrolled in a graduate course on integrating technology into math instruction (Wachira & Keengwe, 2011). Both first-and second-order barriers were found to impede technology integration into mathematics instruction (Wachira & Keengwe, 2011). Once again supporting previous research and disputing claims made by national educational technology plans (U.S. Department of Education, 2000, 2004, 2010), the first-order barrier of availability of technology showed that while progress had been made in providing technology, it continued to remain inadequate (Wachira & Keengwe, 2011). Not enough technology, combined with unreliable technology, as well as lack of technology support and leadership were the remaining first-order barriers (Wachira & Keengwe, 2011). The largest second-order barrier was lack of time (Wachira & Keengwe, 2011). Teachers reported underutilizing what technology was available because they lacked the time necessary to learn to use technology or develop technology activities to use in their teaching (Wachira & Keengwe, 2011).

Lack of knowledge also posed a large barrier to technology integration, which then may have affected the third second-order barrier of anxiety and lack of confidence using technology in their teaching (Wachira & Keengwe, 2011). Wachira and Keengwe's suggested strategies continued to reinforce Ertmer (1999, 2005) and Hew and Brush (2007) when the importance of participation in professional learning communities

to strengthen teacher support and knowledge were discussed. In addition, Whachira and Keengwe urged the participation of teachers in decision making when dealing with technology integration and taking advantage of available resources.

Hechter and Vermette's 2013 study of 433 Manitoban science teachers yielded results consistent with Ertmer (1999, 2005), Pelgrum, (2001), Hew and Brush (2007) and Wachira and Keengwe (2011). Hechter and Vermette (2013) reported a majority of first-order barriers and impediments to the integration of technology in science classrooms. Hechter and Vermette argued a teacher's belief in the importance of the integration of technology into science is not enough, but that the necessary skills and abilities to act upon that belief must be considered essential. If this belief is lacking, it was considered to be one of the most substantial barriers to technology integration (Hechter & Vermette, 2013).

Hsu (2016) conducted a study to examine not only the barriers to technology integration, but the current beliefs and practices concerning technology integration as well. Citing Hew and Brush's (2007) concerns of limitation of previous studies of technology integration in the K-12 classroom, including reliance on self-reported data, Hsu's study employed a mixed-methods approach. The study was limited to teachers in grades K-6, within school districts that maintained a partnership with a large university and their elementary teacher education program (Hsu, 2016). One hundred and fifty-two teachers responded to an online survey of 22 open-ended questions, which included demographic information, questions about technology used in instruction in the classroom, and questions regarding technology resources at both the classroom and school levels (Hsu, 2016). Maximum variation sampling strategy was used to select eight

teachers who represented eight different school districts, a range of grade levels, diverse areas, a range of years of teaching experience, in order to conduct both follow-up interviews and observations (Hsu, 2016).

The finding from Hsu's (2016) study indicated 78% of respondents held constructivist pedagogical beliefs, language arts was the subject involving the highest amount of technology integration, and four main barriers to technology implementation were identified. In contrast to other studies discussed in this review, Hsu's study revealed a shift to technology integration for higher-level use. It was proposed this could be due to the partnership with the university and their education program (Hsu, 2016). Also in contrast to previous studies, the most frequently mentioned barrier was students' lack of computer skills. This was followed by barriers found in previous research: lack of teacher training, and lack of teachers' time and teachers in the study shared similar perceptions of the different barriers to technology integration in the classroom (Hsu, 2016).

Digital Natives and Digital Immigrants

At the beginning of the new millennium, as the nation turned its focus to technology, a theory was proposed by Prensky (2001a), explaining the decline in America's educational system. Despite the nation's second technology educational plan's assertion only a year before, that the use of technology in education was a national priority, where technology should not be left in the periphery, but rather at the core of students' educational experience (U.S. Department of Education, 2000), Prensky (2001a) believed technology was causing a rift. It was Prensky's (2001a) view that students had not made a marginal or incremental shift in needs, as had students in the past, but that an

absolute change had occurred. Prensky (2001a) believed the change was so significant and absolute that there was no going back to the status quo in education. With the advances in technology and its overarching presence in daily life, Prensky asserted present day students were radically different than the students our educational system had been designed to educate. This facet of Prensky's theory was also seen in Ertmer's 1999 article on first-order and second-order barriers to technology implementation when Ertmer referenced Sheingold's assertion ten years earlier in 1991 which stated school environments were fundamentally different than when those teachers were students. This generation, unlike those before it, spend their whole lives surrounded by technology, from email to video games, to cell phones, and the internet, to just name a few of the available technologies (Prensky, 2001a). The nation's third technology plan in 2004, supported Prensky's view throughout the whole report, but particularly when it presented the 2000-2002 statistic that the largest group of new users of the Internet are 2-5 year olds (U.S. Department of Education, 2004). This view was also later endorsed by Palfrey and Gasser in 2008 and Vodanovich, Sundaram, and Myers in 2010, who concurred that this generation of children was different than previous generations in many ways, from how they work, study, and even interact with each other through the common culture of technology which they have known all their lives.

Prensky (2001a) went so far as to postulate students' thinking patterns had changed as a result of the volume of their interaction with technology, with the possibility that their brains may have also undergone a physical change. He posited that the brain, contrary to what was believed during the Baby Boomer generation, is constantly replenishing brain cells and is changing and reorganizing, based on the input received, a

phenomenon known as neuroplasticity and cited several research studies in this area. Prensky (2001a) stated these new learners are accustomed to receiving information in a fast and immediate manner, are used to multi-tasking and parallel processing, function best when networked, prefer games to what they consider to be work, and do best with habitual rewards and instant gratification. In support of this aspect of Prensky's theory, Herther (2009) discussed data from a study from the University of California-Los Angeles' Seminal Institute for Neuroscience and Human Behavior that found students' brains were more actively engaged when navigating a web page than when reading printed text. Vodanovich et al (2010) supported the theory of a change in the wiring of digital natives' brains as proposed by Prensky. Prensky (2001a) stated a life lived with the seamless presence of technology, with different input than previous generations, resulted in students who thought differently and America's educational system was failing by not adapting to these new learners.

In order to illustrate his theory regarding these new learners, Prensky (2001a) coined the term digital natives. He felt this term painted an accurate picture of students who were native speakers in the language of the digital age (Prensky, 2001a). But what of those who were not born in a world of seamless technology; those for whom technology was a foreign language? The term Prensky used for those who have had to learn to adapt and adopt technology was digital immigrants. Prensky (2001a) chose this term in order to illustrate that

> As Digital Immigrants learn-like all immigrants, some better than others-to adapt to their environment, they always retain, to some degree, their 'accent', that is, their foot in the past. The 'digital immigrant accent' can be seen in such things as

> turning to the Internet for information second rather than first, or in reading the manual for a program rather than assuming that the program will teach us to use it. Today's older folks were 'socialized' differently from their kids, and are now in the process of learning a new language. And a language learned later in life, scientists tell us, goes into a different part of the brain. (p.2).

Digital natives have an innate confidence in using technologies and these are essential to their existence (Prensky, 2001a). Prensky (2001a) asserted digital natives have more sophisticated knowledge and skills with technology and, as such, have different learning styles and needs and education must change to address these characteristics. He argued the largest problem facing America's educational system is a scenario of digital immigrant teachers who are struggling to teach the population of digital natives, whereby there are two different languages being spoken. Prensky (2001a) reported digital immigrant teachers are largely unappreciative or unaware of the learning styles and needs of digital natives. He stated digital immigrant teachers prefer to assume learners have not changed, nor should traditional instruction change. When facing this dilemma, Prensky (2001a) argued as much as digital immigrant teachers may wish to keep the status quo, digital natives will not move backwards, as their brains may work differently and it goes against cultural migration. He goes on to explain cultural migration happens when children born into a new culture learn the language easily and resist the "old" language and digital immigrants must accept that which they do not know about this new digital world and rely on digital natives to assist in their learning and integration.

Prensky (2001b) addressed a solution for the successful education of digital natives through a two-pronged approach. Both methodology and content must be reconsidered if we are to meet the learning needs of digital natives (Prensky, 2001b). Teachers must turn their attention to methodology to effectively communicate in the digital natives' language and learning style (Prensky, 2001b). Where digital immigrants believe learning should be lock-step, teacher led, and outcome based, digital natives require a faster pace, parallel processing, and fewer constraints (Prensky, 2001b). When addressing content change with the intent of meeting the learning needs of digital natives, Prensky broke content into two types: Legacy content and future content. Legacy content refers to what A Nation at Risk (U.S. Department of Education, 1983) recommended as the New Basics, reading, writing, mathematics, science, social studies. It was Prensky's recommendation, that while this type of content remains important, it is from a different era and some of it is less important now than in previous generations. Future content would be the content based in the digital age and technology (Prensky, 2001b). This same idea of future content was later echoed by Ertmer (2005). This is not limited to what may be typically thought of in the world of technology, i.e. software, hardware, coding, etc, but must be expanded to include the politics, ethics, languages, and sociology which are interwoven into the idea of typical technology (Prensky, 2001b). Prensky questioned how many digital immigrant teachers were prepared to teach future content and asserted educators must be able to teach both legacy and future content to digital natives. He urged educators to rethink their approach when teaching digital natives.

There are those who did not support Prensky's theory. In response to Prensky's (2001b) assertion digital natives learn differently and the charge for educational reform to

address these differences, Bennett, Maton, and Kervin (2008) analyzed the nature of the claims made by Prensky. When examining the assertion digital natives are more fluent and sophisticated in technology, Bennett et al., (2008) acknowledging their research evidence is limited in scope, concluded Prensky had made more of a sweeping generalization, rather than reporting fact and there was variation within the digital native generation. In regard to digital natives thinking and processing information differently than previous generations, Bennett et al. (2008). again stated, while appealing to common sense, these are only perceptions of digital natives and their apparent ability to multi-task and propensity for discovery-based learning and there is a lack of supporting evidence. Bennett et al. (2008) summarily dismissed Prensky's call for educational reform that would change what digital natives are taught as well as how they are taught. They stated a dramatic change from text-based instruction to a more constructivist approach, with problem solving and authentic learning, based solely on Prensky's digital native characteristics, should be treated with caution and called for more research.

Selwyn (2009) shared Bennet et al.'s (2008) view that a deeper, more empirical lens should be employed when considering digital natives. Selwyn urged the examination of digital natives to rely less on common sense or intuition and more on theory. Selwyn's (2009) review of literature related to digital natives' technology use revealed findings that were not in direct contrast to Prensky's (2001a) theory, but showed more complexity than Prensky (2001b) presented. Selwyn's (2009)meta-analysis of students showed a greater variation of technology use and engagement, according to age or developmental phase, often with more passive consumption than interactive collaboration than Prensky offered in his original theory of digital immigrants and digital

natives. Selwyn (2009) noted Prensky's lack of attention to the importance of circumstances and context when looking at use and no- use of technology. Selwyn (2009) asserted Prensky did not put enough emphasis on the role of the digital immigrant and their importance to digital natives and their technology use. Digital natives needed to have digital immigrant adults who have continued roles in support of them and their use of digital technologies; these adults needed to take joint responsibility in the technical activities of digital natives (Selwyn, 2009).

However, there are many who support Prensky's(2001a) theory of a gap between generations and use his terms digital native and digital immigrant (Autry & Berge, 2011; Hechter & Vermette, 2013; Herther, 2009; Palfrey & Gasser, 2008; Rainie, 2006; Towell, 2009; Underwood, 2007). Pelgrum (2001) consolidated findings from influential policy documents regarding expected educational reform that would address the need for students to be more prepared to thrive in an information society; the findings showed a needed shift from students as passive learners to active participants who do well with teamwork, want to investigate topics of interest, and learn both in and out of the school environment. In addition, the findings showed a shift from teachers as the sole transmitter of knowledge, in a whole group setting, to teachers who are guides to students in their instructional path, with a heavy emphasis on open communication between teachers and students (Pelgrum, 2001). Levin, Arafeh, Lenhart, and Rainie (2002) in a survey of 3,000 public school students, found students perceived their teachers had not shifted their thinking and teaching to respond to the new ways students communicate and use the Web, and the result was a digital disconnect between students and teachers. Rainie (2006) supported Prensky's theory that digital natives in the workplace have

different values and experiences than their digital immigrant counterparts and big business is embracing these differences. Rainie reported digital natives showed different learning styles than their predecessors, excelled at multi-tasking, and did not consider the use of various devices as even using technology per se, but more as an essential part of life that does not require a separate label of "technology". Lenhart, Madden, Macgill, and Smith (2007) supported the findings of Levin et al. (2002) and Rainie (2006) stating teenagers preferred multichannel communications, such as text messaging, instant messaging, and social media, rather than traditional forms of communications, such as face-to-face and email. Underwood (2007) discussed evidence of the chasm between digital native students and digital immigrant teachers in differing language styles when students communicate with teachers versus peers (i.e. text language, abbreviations, level of formality). Underwood (2007) reported that delegates at the "Futures of Learning: New Learning Paradigms Conference" in 2005 did not disagree with Prensky's (2001a) premise and discussed the advantages of harnessing the new and different skills of digital natives. Additionally, the delegates agreed the system in place for student assessment was a barrier to change, as they were too rooted in traditional assessment methods, which do not address students in the digital age. Ten years after Prensky introduced his theory, Hechter and Vermette (2013) agreed students over the past decade both view and use technology differently than generations before them. These students need to be engaged in meaningful and relevant ways in a manner that connects to who they are and how they live their daily lives (Hechter & Vermette, 2013).

While not focused on digital natives, but instead digital immigrants, Herther (2009) presented data from a different study, Your Brain on Google: Patterns of Cerebral

Activation During Internet Searching, that investigated the brain activity of digital immigrants while surfing the web. Half of the subjects were well-practiced in searching the web and half the subjects were not. While initial results showed the web-savvy group to have twice as much brain activity when compared to the brains of the novice group, after a week of training, the less-savvy group of digital immigrants showed brain activity comparable to the experienced group, showing a rapid adaptation. Herther discussed the results of several studies centered on cognitive training which were focused on digital immigrants, rather than digital natives, and found cognitive training and cognitive training technology were beneficial to strengthening cognition of digital immigrants.

Ertmer (2005) contended that to increase teachers' technology use to positively impact student learning, it was crucial to consider and examine how their existing pedagogical beliefs drive their current instructional practices. Eight years after Prensky introduced his theory, Towell (2009) commented on the gap he saw between digital native students and digital immigrant faculty. He reported the gap was not just widening, but doing so at an increasing speed, supporting Prensky's idea that the differences between digital natives and digital immigrants was more than the incremental change seen between past generations. Towell (2009) agreed with Prensky's idea of digital immigrant teachers who must adapt to meet the needs of digital native students in order to maintain relevancy, capitalize on their short attention span, and include for technological pedagogy. Towell (2009), however, pondered if the solution did not lie in changing education, but rather questioned if the long-term solution lay in waiting for these digital native students to age and become digital educators and in the interim, faculty must be prepared to ride the roller coaster of technology in the educational

setting. Towell (2009) further expanded on his experience with digital native students' tendency to embrace new technology at a much faster rate than digital immigrant faculty. He related that it may take digital immigrant faculty multiple exposures to a new facet of technology before adoption occurs, in contrast to digital native students who were able to do so on their first exposure.

As debate continued surrounding the idea of digital natives and their changing educational needs, Nasah et al. (2010) designed a study to investigate the information and communication technology perceptions and preferences of post-secondary students. The purpose of their study was to gain a deeper understanding of post-secondary students' and their technology propensity (Nasah et al., 2010). Their sample of 580 students in a large, metropolitan, public university in the U.S. were given the Digital Propensity Index, a questionnaire designed to determine the daily frequency with which students used information and communication technology, as well as the importance they placed on the technologies. The study examined if age, gender, and socioeconomic status were contributing factors to the use of technology (Nasah et al., 2010). Findings from the study did indicate age as an important factor when looking at participants' inclination toward information and communication technology use. However, age was not the single most important factor contributing to digital propensity, but rather it was the combination of age, gender, and socioeconomic status which made a significant impact on an individual's digital propensity (Nasah et al., 2010). It should be noted one of the limitations discussed was the possibility of the online nature of the survey, which may have been a discouraging factor for individuals with low digital propensity from completing the survey (Nasah et al., 2010).

Helsper and Eynon (2012) acknowledged Prensky's theory of digital natives and digital immigrants and conducted an analysis of a survey in the United Kingdom. The survey was the 2007 Oxford Internet Survey carried out by the Oxford Internet Institute, under the umbrella of University of Oxford. Helsper and Eynon (2012) stated the Oxford Internet Institute is an authoritative source for the use and non-use of the Internet in Britain. The surveys were conducted face to face, multistage probability surveys, with a sample size of 2,350, of individuals aged 14 years and older. The survey consisted of items on Internet users, Internet uses, and the everyday impact of the Internet.

The intent of Helsper and Eynon's (2012) research was to delve deeper into the different aspects which may determine if an individual can be determined as a digital native. The three variables explored were age, experience, and breadth of use. After analyzing the variable of age, Helsper and Eynon (2012) expanded upon Prensky's (2001a) theory of digital natives, suggesting that the surge of Web 2.0 applications may have given rise to a second generation of digital natives. Whereas Prensky (2001a) used a 1980 and later birthdate to identify digital natives, Helsper and Eynon (2012) used a 1990 and later birthdate to mark a second generation digital native. They found that younger age groups/generation did have the widest variety of digital use, as well as a significantly higher incidence of multi-tasking. When examining for experience, Helsper and Eynon (2012) found those individuals who had more experience with the Internet, were more comfortable and capable with using it and other digital technologies. Breadth of use data fell in line with experience as those individuals who had less experience with the Internet, were far less likely to use it (Helsper & Eynon, 2012).

Helsper and Eynon's (2012) study results supported Prensky's theory that younger people have a greater range of information communication technologies in their households, multi-task more, and have higher levels of self-efficacy when using the Internet. However, they did caution that age or generation is not the only significant variable to be considered when defining digital natives. Helsper and Eynon (2012) suggested digital natives and digital immigrants should not be considered as two bilateral and distinct categories, based on generational divides, but rather these definitions must be more fluid to allow for the inclusion of other variables, such as gender, experience, education.

A little over a decade after Prensky introduced the concept of digital native and digital immigrant, Autry and Berge (2011) continued the research into the differences between digital natives and digital immigrants. Autry and Berge (2011) supported Prensky's theory of generational differences and digital natives' use of digital technology is customary. Autry and Berge (2011) used a review of literature, in combination with the authors' experiences, as well as reporting of a survey of generational differences of perceived usefulness of technology in training programs.

Autry and Berge (2011) supported Prensky's (2001a) theory of the characteristics of digital natives who multi-task and flourish at a rapid pace of information and stimulation and of digital immigrants who process information in a linear fashion and at a slower pace. In addition, Autry and Berge (2011) supported Prensky's (2001b) theory that digital natives' brains, while processing information in the same manner, allow they may store information differently than digital immigrants and in such a way that results in different outcomes. An issue addressed in A Nation at Risk (U.S. Department of

Education, 1983) was the breakdown of America's educational system and the amount of training required by industry and the military to remediate the workforce. In this vein, Autry and Berge (2011), discussed the challenges in the training and developing of the future workforce, due to a communication barrier between digital natives and digital immigrants. Much like Pelgrum a decade earlier in 2001, Autry and Berge (2011) viewed digital native students and digital immigrant teachers as dependent on one another to create effective instruction and training and urged both to work toward removing barriers to align their learning preferences.

Implications of Digital Immigrants

Czaja et al. (2006) data indicated older adults had more difficulty in learning to use and operate current technologies than do younger people. They elaborated further stating older participants report less use of technology than middle aged people, and older and middle-aged people using less technology than the younger participants in the study (Czaja et al., 2006). Within the variable of computer experience, the researchers also reported a gap between younger participants and middle aged and older participants (Czaja et al., 2006). This also held true between age differences within each gender (Czaja et al., 2006). Continuing to support Prensky's theory, younger people also had greater differences of computer experience, experience with and breadth of use of the Web, and Web activities (Czaja et al., 2006). Czaja et al. (2006) concluded those who have less use of technology, in a society with increased use and reliance on technology, would be more likely to become disadvantaged and disenfranchised, particularly in the workplace, where technology is an essential tool.

While Czaja et al.'s (2006) study was not focused particularly on teachers, Inan and Lowther's 2010 study gathered data from 1,382 public school teachers in Tennessee. Path analysis was employed to examine direct and indirect effects of teacher characteristics, as well as school factors, on teachers' technology integration (Inan & Lowther, 2010). Variables ranged from teachers' age and years of teaching to teacher beliefs and readiness and technology integration (Inan & Lowther, 2010). A two-part questionnaire was used to collect teachers' perceptions of computers and technology integration (Inan & Lowther, 2010). Study findings revealed when there were increases in teachers' years of experience, their feelings of readiness to integrate technology decreased (Inan & Lowther, 2010). In addition, age and years of teaching experience showed negative influences on computer proficiency, leading the researchers to conclude computer proficiency decreases with years of teaching experience (Inan & Lowther, 2010). Inan and Lowther reported their results to be congruent with previous research indicating teacher age directly affects computer proficiency and indirectly affects technology use and this could result in veteran teachers experiencing limited opportunities to change their teaching practices or to integrate technology.

Heinz's 2013 research focused on predictors of technology adoption by older adults. This mixed-methods study had a sample size of 176 participants, with a wide age range. Of the results reported, older participants, or digital immigrants, were significantly less likely to use technology than younger participants, or digital natives (Heinz, 2013). One of the significant direct effects on technology adoption and perceived usefulness of technology was age, indicating younger participants were more likely to adopt technology and had a greater perception of its usefulness, which may then predict

technology use (Heinz, 2013). It was noted, older participants with relatively high adoption levels emphasized their efforts to evolve and stay current with technology as it came out (Heinz, 2013). Heinz echoed Czaja et al.'s (2006) earlier assertion that individuals who do not adopt technology will be left behind as the world of technology continues to grow and pervade all aspects of everyday life. Heinz (2013) suggested further qualitative research focused on the exploration of older adult technology use.

Olson, O'Brien, Rogers, and Charness (2011) proposed that while research indicates older adults do not, or cannot, use technology, this may be a misconception, and older adults do use technology, but possible at different usage rates. Their study included 430 younger adults and 251 older adults, from three ethnically diverse and geographically separate areas of the United States (Olson et al., 2011). Surveys, comprised of four sections, were administered from 2006-2008 as part of the CREATE research program (Olson et al., 2011). Results indicated older adults were not averse to using technology, however, their choice of technology and frequency of use differed from those of younger adults. In addition, they preferred technology that had been in use for longer periods of time and were slower to adopt technology (Olson et al., 2011). The researchers used the term "Silver Surfer" (p. 123) to describe older adults, or digital immigrants, whose technology adoption mirrored younger adults, or digital natives (Olson et al., 2011). Olson et al. (2011) stated the existence of few studies providing in depth information on technology use for older adults/digital immigrants, as compared to younger adults/digital natives. Therefore, the purpose of this study is to examine public school teachers as digital immigrants and the critical influences, factors, or beliefs that may have shaped them to accept and meaningfully integrate technology into their classroom instruction.

This chapter reviewed the literature base used to inform this study. Chapter three will provide an overview of the methodology for this study. Chapter three will include a discussion of the qualitative design of the study. Participant selection and setting of the study will be discussed. In addition, data collection and data analysis procedures will be reviewed.

Chapter III

METHODOLOGY

This chapter details the qualitative organization of this study which examined the lived experiences of digital immigrant teachers and how those experiences impacted their use of technology. The research design of case study, the selection of participants, and the setting were discussed. Data collection methods, procedures, and analysis were explained. Data collection methods included in-depth interviews, direct observations, field notes, and document review. The selection of participants, the setting of the study, the data collection methods and analysis were also addressed.

Research Design

Stake (1995) discussed the nature of quantitative research and its purpose to seek to control and explain, whereas qualitative research seeks to understand complex relationships. Yin (2014) posited when examining contemporary events, the case study is preferred over other qualitative methods. Descriptive case study describes the case, within its context, as thoroughly as possible, where, prior to the study, researchers would state a descriptive theory (Yin, 2014). Understanding there are three general types of case studies (Yin, 2014), I chose a descriptive case study approach. As this particular study explored the lived experiences of digital immigrant teachers in the context of the classroom, and how they have embraced the use of technology in their teaching practices, a descriptive case study methodology was appropriate.

This qualitative study investigated the lived experiences of digital immigrant teachers and their use of technology in their teaching. Through the inductive process of case study as described by Creswell (2009) and Merriam (2002), I gained insight and a deeper understanding from the participants how they, identified as digital immigrants, have meaningfully implemented technology into their teaching practices. The study had three research questions to guide the investigation of digital immigrant teachers and their lived experiences with technology. The intent of this study was to understand the challenges digital immigrant teachers faced when learning new technology and how their teaching has changed to incorporate technology in their classrooms.

Using qualitative inquiry and thick descriptions, I explored how digital immigrant teachers successfully bridge the digital divide from their students in order to meaningfully integrate technology in their classrooms. The design of this study was a descriptive case study, as I was seeking to describe the phenomenon of digital immigrant teachers in depth (Merriam, 2002; Stake, 1995). The unit of analysis in the current study was the digital immigrant teachers' experiences, not all teachers, which created a bounded system (Merriam, 2002). The research questions that guided this investigation were:

1. How have digital immigrant teachers' attitudes towards technology in the classroom changed over the course of their teaching?
2. How have digital immigrant teachers use of technology changed over the course of their teaching careers?
3. What are the challenges digital immigrant teachers face as they implement technology into their teaching?

Setting

The setting of the study was two public school districts in the southeastern United States. One system was a large public school within a large metropolitan school district and the second system was a smaller public school in a nearby county to the first system. The larger district had over 113,000 students currently enrolled in the system in Kindergarten through 12th grade. Elementary students alone comprised over 50,000 students. The number of certified teachers in the district was more than 10,000 and of those, more than 60% of employees held an advanced college degree. Student population increased by 3,000. While budget cuts resulted in a decrease of 196 classrooms from 2007 to 2015, the students per instructional computer saw a change from 2.41 to 1.84, Internet Safety Training became standard protocol for all students, teachers, and administrators, the number of mobile wireless labs increased from 377 to 633, and Bring Your Own Technology (BYOT) became an option for students, faculty, and administration.

The smaller county in the study was geographically close to the larger county. A priority for this county was staying abreast of technology. According to the county website, the county in which the research took place, mirroring the national trend, has seen growth from 2007 to 2019. Student population increased by 1,958. According to the district FY2019 Budget Overview, the county's 5 year strategic plan places and emphasis on enhancing technology infrastructure, equipment and systems. This part of the plan focused on refreshing and/or updating a minimum of 20% of obsolete technology equipment and systems every year for the next 5 years. In addition, the county offers a program with decreased cost of home internet through a partnership with

Comcast, a program that offers decreased cost of hardware through Dell, and a BYOT (Bring Your Own Technology) initiative.

Participants

In contrast to a quantitative study, where a large population may be randomly selected, the qualitative nature of this study guided the need for purposive sampling (Patton, 2002). Patton discussed the strength of purposeful sampling as the deep understanding that can be gained from selecting "information rich cases" (p. 46). Yin (2014) also stressed the importance of access to cases that will be the most useful in addressing research questions. The participants for this study were purposefully selected as discussed by Merriam (2002) and Patton (2002). By using purposeful sampling, the criteria for which are described below, I worked to ensure participants had the requisite experiences and traits to enable me to delve into digital immigrant teachers' lived experiences with technology and gain insight into how technology was used in their teaching practices.

Selection Criteria

The first criteria for drawing the sample of the study consisted of teachers who were digital immigrants, which is defined as teachers who were born before 1980 (Prensky, 2001a). Any and all teachers born after 1980 were excluded from the study. The second criteria used for participant selection was the self-ranking on the survey instrument sent to teachers, based on the LoTi "Sniff" Test. Only those teachers who rated themselves in the 3-6 range were selected for possible participation in the study. The third criteria was site selection. When reviewing possible participants, I looked for a variety of school settings. The fourth criteria was years of service. The minimum years

of service of a digital immigrant teacher to participate in the study was five years, as this study was examining opportunities for innovation and change over the course of time and the first five years of teaching may not allow enough time for this to occur.

Selection Procedures

Within the larger school system, due to time constraints, one principal at the elementary school level was contacted and emailed a request to send the VSU Qualtrics survey (see Appendix A) to staff. The principal agreed to send the survey to staff and the 53 survey responses, once received, were first sorted by the age of the respondent. All 17 responses from teachers born after 1980 were discarded. Twenty-six responses of teachers born before 1980, but not willing to be contacted by the researcher where then discarded. Ten responses of those born before 1980 willing to be contacted by the researcher were then categorized by low, middle, and high technology use teachers. Responses self-reported to be low (0-1) and midrange (2) were set aside, leaving 9 teachers born before 1980, willing to be contacted by the researcher and with a self-reported level of 3 and above.

This same process was used for survey responses in the smaller school system. In the smaller system, a total of 33 principals were contacted. When initial response did not support a viable number of possible participants for the study, a follow up email was sent two weeks after the first email. Six principals responded to this email and agreed to send the survey to their staff and the process described above was followed for all 154 survey responses. Of the 154 responses, all 77 responses from teachers born after 1980 were discarded. Sixty-six Responses of teachers born before 1980, but not willing to be contacted by the researcher where then discarded. Eleven responses of those born before

1980 willing to be contacted by the researcher were then categorized by low, middle, and high technology use teachers. Responses self-reported to be low (0-1) and midrange (2) were set aside, leaving 11 teachers born before 1980, willing to be contacted by the researcher and with a self-reported level of 3 and above. While it was my intent to have a broad range of grade levels in the smaller system, the responses received showed a response from only 1 elementary school teacher, and 5 middle and 5 high school teachers who indicated they were willing to be contacted by the researcher.

Each possible participating teacher was contacted by me via email, given information on the study, and invited to willingly take part in the study. Grade level, gender, classroom placement, and cultural background of teachers will not be factors which will singularly affect selection. As Patton (2002) explains, the sample size of a qualitative study, in direct contrast to a quantitative study, is often rife with ambiguity and "there are no rules for sample size in qualitative inquiry" (Patton, 2002, p. 244). Siedman (2006) also addresses the difficulty of sample size in qualitative research when he is reluctant to provide a concrete number of participants.

Out of those contacted who agreed to participate in the study, a total of nine were chosen, based on meeting the above criteria and their willingness and availability to participate in the study. To obtain the depth of data necessary for this study, in a timely manner, eight was originally chosen as the maximum sample size, as this number will allow for rich depth of information, providing a sufficient number of participants, without getting lost in what Patton (2002) refers to as the breadth of too many participants. Eight participants allowed for a margin of error if participants needed to drop out of the study for any reason and one respondent who initially agreed to participate declined before

interview number one was conducted. Of the remaining participants, 3 were from the larger county (all elementary school teaches) and an initial 4 were from the smaller county (2 middle school teachers and 2 high school teachers), for the beginning sample size of 7. However, after completing all three the interviews, one participant was removed from the study, as I determined the participants' self-ranking of 6 on the LoTi "Sniff" Test was inflated. Throughout the span of the 3 interviews, it became evident the participants' actual use of technology with students fell in the 1-2 range. This brought the sample size to six.

Initial contact was made via email and participants were informed of the purpose of the study, the protocol of the study and the measures that would be taken to ensure confidentiality throughout the process. In the interest of protecting each participant's anonymity, participants' actual names were not used in the reporting of the research. I agreed to protect the participants' anonymity by not disclosing names, school locations, school names, or any other identifying characteristics. Each participant chose their own alias to be used in the study. Each participant was given a copy of their signed consent form, which indicated the purpose of the study and their willingness to participate in the study. Signed consent forms, audiotapes, transcribed interview, journals, all notes, and any other documentation are contained in a locked file cabinet in the researcher's home office. Audiotapes and all other documentation will be kept for three years following the acceptance of the dissertation and will then be destroyed.

Data Collection Procedures

Data collection took place through multiple approaches and over the course of time from January 2019-May 2019. In qualitative research, the researcher is the primary

data collection and analysis instrument (Merriam, 2002). Of the six sources of evidence presented in detail by Yin (2014), this study employed in-depth interviews, direct observations, and document review. Siedman's (2006) interview method involves a series of interviews and was followed with all participants in this study. In this study, a series of three in-depth, semi-structured interviews per participant, allowed the researcher to interact with the participants in more of a conversation that could be guided both by the interviewer and the participants' responses, as opposed to a survey, that would have a more rigid structure. This format allowed for more flexibility when interviewing participants, as the researcher was not expected to stick to a pre-determined script. Participants were observed while teaching lessons that incorporated technology. Lesson plans were also examined in order to investigate the participants planned use of technology and the application of the technology with students. As suggested by Hsu (2016), employing interviews, direct observation, and document review decreased the limitations of solely relying on self-reported data on the LoTi "Sniff" Test.

In Depth Interviews

Creswell (2009) recommends following an interview protocol for in depth interviews with each participant. Each participant was interviewed separately. Participants were given the interview questions at least 3 days before the interview took place. All interviews were conducted with the same set of predetermined, open-ended questions, although additional questions were asked during interviews, based on participant responses. All questions were designed to encourage participants to reflect and elaborate on their experiences with technology. During every interview, participants were also given opportunities to provide additional insight or experiences if they so

desired. Interviews were conducted at the date, time, and safe location of the participant's choosing. The interviews with all participants were held at a convenient time designated by the individual participant.

While note taking occurred during interviews, in order to ensure accuracy, with signed participant consent (see Appendix B), interviews were audio recorded (see Appendix B), then later transcribed by a professional transcription service. Audio recording was chosen over video recording, as many people are uncomfortable being video recorded and it was my intention for the participants to feel as comfortable as possible during interviews. A transcription company offered accurate transcriptions of audio recordings. The transcription company was one that employs US based transcribers and guarantees 98% accuracy. Interviews were transcribed and then reviewed and analyzed by me before the next interview with each participant and participants were asked to member check all transcripts for accuracy.

While I had a set of structured questions, the format of the questions were open-ended and designed to encourage discussion, flexibility, and self-reflection of lived experiences that have had an impact on participants' technology use in their instruction. The questions were structured in such a way as to avoid "leading" the participants' responses. There may have been follow up or additional questions added, based on participants' responses, with the intent of deepening the researcher's understanding of comments made by the participants.

Siedman's (2006) intent behind more than one interview is to build a relationship between the researcher and the participant(s) within the context of their lives, as Siedman views interviewing as not only a research methodology, but also as a social relationship.

Each interview served a purpose distinct from the others, as well as within the series of three, as each interview was intended to build a foundation for the following one (Siedman, 2006). Each interview was intended to build an expanse of knowledge regarding the participants' perceptions of their lived experiences. Siedman (2006) cautions the length of time for the interview be set before the interview process has begun, for the sake of providing unanimity, and recommends 60-90 minutes. This study followed Siedman's (2006) recommendation on time, although there was some slight variation between participants, with an average time of 75 minutes. Siedman (2006) recommends each interview be spaced from three days to a week apart, as this gives enough time for participants to ruminate on their interview and not lose the connection before the next interview. However, Siedman (2006) does allow that this time frame is not always possible and is not an absolute. Siedman's (2006) recommendation for spacing of the interviews were followed as closely as the particpants' schedules allowed, but due to the demands of teaching and scheduling conflicts, more time elapsed between interviews than Siedman (2006) recommended.

The first interview in the series focused on the participants' life history as it relates to technology (Siedman, 2006). The goal of this interview was to put the participants' experience as digital immigrants teaching with technology into context. Siedman (2006) cautions against the use of "why" questions, instead asking "how" questions. By avoiding "why" and using "how" the participants came to use technology in their teaching, the intent was to help the participants reconstruct their lived experiences with technology in their teaching (see Appendix C). A question in this first interview was, "How did you come to adopt new/unfamiliar technology in your teaching?"

The second interview deals with the detail of the digital immigrant participants' current teaching practices involving technology (Siedman, 2006). This interview was an avenue to collect small details in the participants lived experiences as digital immigrants teaching with technology (see Appendix D). The participants were asked to describe a typical lesson using technology, as well as what a typical day of teaching looks like. A question in the second interview was, "What is it like to integrate technology into your teaching as a digital immigrant?"

The third interview provided the opportunity to ask the participants to reflect on the meaning of their lived experience of teaching with technology as a digital immigrant (see Appendix E). This interview was intended to address the connections, both intellectual and emotional, between the digital immigrant participants' work and life. Siedman (2006) notes that making this meaning requires the participants to examine how factors in their lives interacted to bring them to their present experience. An example question was, "Given what you have said about using your past experiences, challenges, successes with technology and how you use it today, how do you see yourself using technology in the future?" and "What does it mean to be a digital immigrant who uses technology in your teaching?"

The interviews were designed in such a way as to allow the participants to describe their personal experiences, both positive and negative, with meaningful technology integration, with as much detail as each participant cared to share. The questions helped to guide the interview (Merriam, 2002; Siedman, 2006). As some time may have passed between participants' self-ranking and the initial interview, prior to interviewing each participant, each participant was asked to view their LoTi "Sniff" Test

and how they self-rated their level of technology integration. The self-rating on the LoTi continuum was intended to help participants reflect on their technology use and their beliefs and lived experiences with digital tools. In addition, it also served as the basis for dialogue during the interviews, as I referred to the respondent's self-ranking during the interview. After each interview, I completed an Interview Reflection sheet (see Appendix I), which according to Creswell (2009), could be useful in understanding the data in a different light, as well as providing general impressions, helpful observations, and information in future interviews with participants.

Direct Observation

In order to view the phenomena of technology integration, direct observation of participants took place within their instructional setting. Merriam (2002) and Patton (2002) both emphasize observational data as crucial, for it provides firsthand interaction with the phenomena, as opposed to the secondhand information provided in an interview. One of the strengths of direct observation both Patton (2002) and Yin (2014) discuss is how observation may allow the researcher to see phenomena or details that may go unnoticed or be viewed as routine by those within the setting. Observations also reduce the limitation of relying solely on self-reported data, as Hsu (2010) points out, the potential problems and limitations of teachers self-reporting, which may be inaccurate or incorrect estimations of their ability or use of technology.

By conducting classroom observations of the participants, as a non-participant observer, I was able to gain an authentic portrayal of not only how technology was meaningfully integrated, but also the level of student engagement. One observation of each participant was conducted solely by the researcher and took place during the

instructional day. Observations took place after the second interview. Observations ranged from 45 minutes for 60 minutes, depending on each participant's class schedule. I was able to meet with each participant, briefly, after each observation. Again, this them varied for each participant, as schedules and allowed time varied for each participant. The purpose of this time was to have an informal conversation, where I or the participant was able to ask questions about the observation or the participant offered reflections on the lesson. The LoTi framework and researcher created Observation Guide (see Appendix F) served as a guide for the researcher when conducting observations.

Field Notes

Patton (2002) states while there are many options for taking field notes, the act of taking field notes in and of itself is not optional. As mentioned above, during observations, I used an Observation Guide. This sheet had demographic information recorded (grade level being observed, subject, etc), an area for a rough physical sketch of the layout of the space, and an area for notes. The notes fell into two categories. Patton (2002) delineates the differences between descriptive and reflective field notes. Descriptive notes were objective in nature, describing the lesson, teacher actions, student actions, or as Patton (2002) refers to the *who*, *what*, *how*, *where*, *when* aspects of the observation. Descriptive notes described the roles of the participants in the setting. Descriptive notes contained direct quotations. Reflective notes were used to record my reflections, feelings, ideas, impressions, and thoughts as I observed the lesson. Reflections were subjective in nature. Unanswered questions or concerns were recorded in reflective notes.

Field notes are somewhat fluid documents that can be taken and employed in different ways, according to the situation being observed and the researcher (Patton, 2002). Field notes go through more than one stage of development (Patton, 2002) and "are the researcher's written documentation of participant observation, which may include the observer's personal and subjective responses to and interpretations of social action encountered" (Saldaña, 2016). The first stage centers around the short hand, quick notes I wrote down as I was observing in classrooms. As mentioned, observations were divided into two distinct categories. Once I left the field, I moved past initial, rough notes and added as much detail as possible, as soon as possible after leaving the field from observing and meeting with the participant for reflections. After the intermediate notes were recorded, when more time allowed, I elaborated with the intention of recreating the scene with rich detail, with more observer comments. In addition, the interview and observation reflection sheets that were completed after each interview and observation were also included in field notes and in the data to be analyzed and coded.

Document Review

Lesson plans were requested from each participant for each observation. It was the participants' choice of how to transmit the lesson plans to me at least one day before the scheduled observation (i.e. email, county mail). Patton (2002) asserts documents may be able to provide information that cannot be observed and may also be used to help clarify information from interviews or observations. In addition to lesson plans for the observation, I asked the participants to select a unit (10-12) of lesson plans that reflect the use of technology in their teaching practices. Documents were analyzed and codes

developed, which were used in the coding process. The coding process is described in the data analysis section of this chapter.

Journaling/Memoing

A journal was kept in order to record such topics as: my reactions to interviews and observations, reflections and significance of these events (Patton, 2002). Some writing took place immediately after experiences within the scope of this study. While journaling, I made note of any insights or interpretations, as well as notes regarding inspirations and significant events (Patton, 2002). This reflective writing was intended to keep me connected to the research, study, and participants. Included in journaling was also future interview questions or modifications. Interview Reflections were kept in my journal as well. Creswell (2009) and Patton (2002) both relate the importance of thick and rich description when journaling. These documents were included in the coding process.

Instrumentation

The main instruments employed in this study were in-depth interviews, observations, and document review. The series of three interviews and one observation focused on the digital immigrant teacher and their use of technology in their teaching. While individual interviews and observations provided the bulk of data for this study, there were companion documents and data, such as interview guides, interview reflections, and observation sheets.

LoTi "Sniff" Test

For the purposes of this study, the Levels of Teaching Innovation or LoTi "Sniff" Test (Appendix G) was given to participants as a filter for participant selection.

Participants were asked to rank themselves on the LoTi continuum. According to the LoTi Connection website (LoTi Connection, n.d.), the LoTi framework has been used in over 37 states and in countries ranging from Puerto Rico to Japan to Saudi Arabia, as well as in over 100 dissertations and research studies conducted worldwide. In addition, the LoTI evaluation for teachers and principals is approved or under review for use across the country. Any teacher who is engaged in the act of teaching, can be classified into a LoTi level, even if that level is LoTi 0: Non-use (Moersch, 1995). The degree to which innovative teaching is occurring is what determines a teacher's LoTi level on the continuum.

The LoTi Digital-Age Survey, framework, and "Sniff" Test are the work of Christopher Moersch (1995). It should be noted the current study does not use the Digital-Age Survey, but the framework and "Sniff" Test. Mahta (2011) stated the LoTi Digital-Age Survey and framework are based on Bloom's taxonomy and the concerns-based adoption models, research on ICT in the classroom, research from Apple's Classroom of Tomorrow, and Moersch's research from observing classrooms throughout the nation. The LoTi framework has been aligned with ISTE's National Educational Technology for Teacher standards (Mahta, 2011). Mahta reviewed the structural validity of the LoTi Digital-Age Survey, conducting an exploratory factor analysis, as well as a confirmatory factor analysis (Mahta, 2011). The sample of 2,840 teachers was comprised of teachers across the country in elementary grades (47%), intermediate grades (21%), and secondary grades (24%), with another 8% teaching all grades or not reporting grade level taught (Mahta, 2011). While Mahta's findings suggested some revisions to the current Digtial-Age Survey would represent a more accurate picture of a teacher's

technology implementation, it was concluded that it could be used to frame the context of a teacher's technology implementation with respect to ISTE's NETS-T. Again, this study will not use the Digital-Age Survey for quantifiable data. However, the LoTi framework serves as the conceptual framework for this study and the LoTi "Sniff" Test are an appropriate fit for the current study.

The LoTi framework starts at level zero and progresses to level six. Level zero, Non-use, would indicate in an instructional setting, purposeful learning, which may include the use of digital resources, is not being supported or promoted. Level one, Awareness, is evidenced by instruction focused on lower levels of cognitive processing and the teacher is the only one using the computer for task-oriented purposes (data entry, word processing, etc).

Level two, Exploration, focuses on lower levels of cognitive processing, as well as a focus on content understanding. As opposed to earlier levels, digital resources are now being used by students, however the purpose is more on the *use* of technology for technology's sake, rather than content. At level three, Infusion, the focus shifts to students' higher order thinking. At this level, the teacher is directing tasks and problems with more in-depth content and the teacher and students are now using digital resources to engage in higher level thinking, while the teacher continues to be the one directing the learning or problems to be solved.

It is in Level four, Integration, where there is a shift; students are now examining real world issues and taking a more active role in solving problems. Level four is then broken down into two levels, or subcategories, where the differentiating factor is classroom management or school climate, as both of these can restrict a full

implementation of technology. This is the only level in the framework which has sublevels. The first subcategory of Level four, Integration, is 4a, Mechanical. This is evidenced by classroom management issues, or even larger issues in the school. Outside resources are heavily relied upon to capture and retain student involvement. The second subcategory, 4b, Routine, is evidenced by students who are fully engaged in higher order thinking, without classroom management issues or the teacher relying on outside assistance. Learner centered strategies are the focus at this level and students are motivated because they are investigating student generated questions and problems.

Level five, Expansion, builds upon 4b, in that students are still involved in authentic problem solving and investigations, but these now extend beyond the walls of the classroom. Students are more involved in goal setting, self-monitoring, and collaboration with others. LoTi level six, Refinement, involves a curriculum that is based on the learners and their needs and interests. Access to technology at this level would be for the most up to date and current digital tools.

In-Depth Interviews

Siedman's (2006) interview protocol was followed. As discussed earlier in this chapter, the purpose of the series of three interviews was to obtain rich information to the point of saturation and sufficiency (Siedman, 2006). Interview guides and reflections sheets were used. Patton (2002) and Stake (1995) discuss interview guides and their use. An interview guide was used for all interviews, with the purpose of establishing a focus for that particular interview (Stake, 1995). Patton (2002) asserted the use of an interview guide, as opposed to a rigid set of questions, allows the researcher to be free to build a conversation with a participant within a certain subject area while continuing to establish

the conversation. In order to ensure content validity, these guides were shared in a draft format with my committee for review. Once feedback was received, these documents were refined, and necessary modifications were made. The interview reflection sheet was used solely for my reflection on each interview, helping to guide next steps and actions and improving the interview process.

Observations and Observation Guides

Yin (2014) discussed the importance of direct observation for gathering evidence in case study research and its building reliability of data gathered. One observation was conducted for each participant. The purpose of the observation was to view the lived experience of each digital immigrant using technology in their teaching. This observation took place after a participants' second interview and before their third interview. The observation took place after the second interview to allow for the opportunity to discuss what was observed, if needed, during the third and final interview.

The observation guide (see Appendix F), as outlined by Creswell (2009) and Patton (2002) contained demographic information, such as the date, time, and participant observed. Patton (2002) cautioned against the common mistake of the researcher taking the physical environment for granted, therefore the observation guide had an area for a rough sketch of the physical layout of the room in which the observation took place. There was a separate and distinct sections for descriptive and reflective notes, as recommended by Creswell (2009). This also allowed a means for me to make note of things relevant to the study's research questions while in the field. Descriptive notes contained direct quotes, or descriptions of teacher or student actions. Reflective notes

may contain my notes about what is seen, heard, experienced, or thought about during the observation setting.

Data Analysis

In-depth interviews, observations, documentation, journaling, and artifacts were expected to provide a large amount of data. Artifacts and data collected from the observations were used to provide insight and determine themes. Interviews were audio recorded and transcribed by a trustworthy transcription service.

Open-coding was used to analyze the data from LoTi self-evaluations, interviews, observations, lesson plans, reflection sheets, and journal entries. Merriam (2002) discussed the progression from open coding to axial coding to selective coding. I used this protocol to analyze data from this study. During open coding, data was named, and initial codes were assigned to text, which was then grouped together in order to generate common themes or categories. Miles' and Huberman's (1994) use the analogy of codes as an index of categories and a way to structure texts and then comparing these categories to find patterns or themes. Merriam (2002) states categorizing will result in reducing the number of individual code words, under larger categories, making code notes, which are a type of memo.

Following open coding, axial coding took place (Merriam, 2002). Merriam (2002) described open coding as taking the data apart, while axial coding puts the data back together. However, when putting the data back together, I was looking for categories that cut across all data sets. In a progression, after open coding, I made a list of all code words, then cluster similar codes, then reduced this list to manageable main categories (Merriam, 2002). Siedman (2006) urged caution when making labels and

categories permanent, as confining in permanent categories too early in the process can lead to dead ends.

Selective coding involves taking the categories created from axial coding to form a fundamental theory (Merriam, 2002). The theory should describe categories that emerged from the data and are interrelated. The identification of a core category should then result in remaining categories related to the core category (Merriam, 2002). These themes are reported in Chapter Four, the results portion of the study.

Computer-Assisted Qualitative Data Analysis (CAQDAS) software was used for transcription analysis, organizing data, and content analysis; however, it should be noted that this software differs from quantitative software in that it does not analyze or manipulate the data (Patton, 2002; Yin, 2014). Using CAQDAS, each piece of data will be uploaded to the software and will become a primary document (PD). All the primary documents then formed a hermeneutic unit (HU). Atlas Ti software (Atlasti.com, n.d.) was used for this purpose. This software application assisted in locating, organizing, coding and analyzing data. The software is capable of consolidating large quantities of data (i.e. interview transcripts, interview reflection data, observation notes, photographs, research articles, observation reflection data, artifacts). Additionally, the software provided analytical and visual tools to generate conceptual diagrams or maps.

Triangulation was used to establish consistency, internal validity, accuracy, and credibility (Merriam, 2002; Patton, 2002; Yin, 2014). Of the four types of triangulation described by Patton, multiple sources of date were employed. Interviews, observations, documentation (lesson plans) were collected and used for triangulation.

Validity and Credibility

While it is indisputable that qualitative research ensures validity, Siedman (2006) illuminatesd the ideas of several other researchers who argue for a changed vocabulary when discussing reliability and validity. These researchers (Ferrarotti, 1981; Kvale, 1996; Lincoln & Guba, 1985) use the terms, "trustworthiness", "credibility", transferrability", and "quality of craftsmanship" (Siedman, 2006, p. 23-4). In order to assure internal validity, triangulation of multiple data sources must occur. Merriam (2002) presented four types of triangulation. Multiple data sources were chosen for triangulation in this study, as this study did not have multiple researchers, multiple theories, or multiple methods. Interviews, observations, member checking and documents were examined in order to present data that is credible. Siedman (2006) predicated the structure of a three-interview protocol and its ability to enhance validity through several features. The protocol allowed participants' comments to be placed in context, participants were seen over a matter of weeks, which allowed for checking of consistency. In addition, it allowed the researcher to connect each participants' experience against those of other participants. Member checking established credibility, in that it gave the participants the opportunity to identify any miscommunication, misinterpretation, or misuse of information provided in the interview(s) (Creswell, 2009; Merriam, 2002; Patton, 2002; Stake, 1995). All participants were asked to review their transcribed interviews to verify they were properly interpreted what they conveyed. Participants chose how they receive the transcriptions (email, county mail, hand delivered). Participants provided some clarification during member checking as needed, but there were no major errors found during member checking. An audit trail was used

throughout the study through the use of field notes. A journal was kept by the researcher, recording protocol and reflections throughout the study. This audit trail will allow readers or independent researchers to follow the path of the researcher (Lincoln & Guba, 1985). In addition, the audit trail described how data was both collected and analyzed.

Limitations

There were several limitations to this study. The scope of this study was limited to teachers and schools within two school systems. While the study did take place in two different counties in the Southeastern region, which could add to the robust nature of the study, one county was considerably larger than the other, which could affect many factors, from available technology and support to quality of training offered to teachers. However, the larger county was limited to one elementary school, which could make the transferability of the findings limited to similar settings. This school was in an urban area, with a high population of low socio-economic families and not inclusive of rural schools or schools with a higher socio-economic families. The smaller county had participants in middle school and high school and zero participants in elementary school, and the findings that emerged for the different systems may not be transferable to individuals in different settings. The selection of teachers was based on employment within the participating school districts, age, number of years teaching, and differing implementation of technology. While a case study approach allowed for a deep understanding and detail, limiting the study to a small number of participants and schools placed constraints on the research. More generalizable and comprehensive data could be collected if the study took place in an increased variety of geographical locations and

grade levels. In addition, five of the six participants were female, which may make the transferability of this study limited.

It should be noted a single or small sampling does not allow for broad generalizations. However, Patton (2002) does allow for logical generalizations to be made with a single or small case sampling as is the case with this study.

Clearly, the meaningful integration and use of technology was influenced by the amount and type of technology available to teachers. This study was limited in that technology distribution is not the same for every teacher and every classroom. One of the school districts was a smaller district in the state, which limits generalizability to other districts which may be smaller or larger, in more rural or ubran areas, or have restricted access to technology. In addition, not all students had the same access to technology outside of the school arena, which could then affect their comfort level and acceptance of technology during instruction.

The participants were volunteers which could mean there was bias during self-reporting on the LoTi "Sniff" Test. Simply being willing to volunteer for the study may not be a true representation of digital immigrant teachers' technology integration. Hew and Brush (2007) caution a limitation of self-reporting is the participants answering with an idea of what is a socially desirable or acceptable responses or exaggerating their technology integration within their teaching practices. In an attempt to overcome this limitation, participants were assured of their anonymity within the study and we asked to choose the name used for them in the reporting of the findings.

My lack of previous case study research was a limitation to this study. My preconceived notions, subjectivity, and bias regarding the importance of technology

integration may also have affected the lens through which the participants were viewed. The qualitative data may have been subject to my bias due to coding by only one researcher. Additionally, the period in which data collection occurred was from January to May. Given a longer window to collect data, additional common themes may have emerged, strengthening the analysis and results of the study.

Ethical Considerations

Approval for this study was obtained from Valdosta State University's Institutional Review Board (IRB) (Appendix G) and the participants' school system IRB. Consent forms were collected from each participant. As interviews were an integral part of this study and primary data was collected from recorded, transcribed, member-checked, semi-structured, in depth interviews, permission was obtained from the participants to audio tape the interviews. Participation in the study was voluntary. There was no penalty for withdrawal from the study at any given time. Each participant was thoroughly informed of the purpose and intent of the study and were given the right of refusal.

There were no apparent risks to participants in the study, but all measures were taken to ensure anonymity for teachers and students. Each participant chose their own alias to be used in the reporting of data. The researcher was a non-participant observer during all observations and did not intervene in the classroom in any way, shape, or form. All participants were given the opportunity to confirm the accuracy of the data collected through member checking (Creswell, 2009).

This chapter reviewed the qualitative methodology guiding this study. Through interviews, observations, and document review, I investigated the critical influences,

factors, or beliefs that may have shaped digital immigrant teachers to use technology in their teaching practice. Chapter 4 provides the results for this study.

Chapter IV

FINDINGS

The purpose of this qualitative study examined public school teachers as Digital Immigrants and the critical attitudes, challenges or beliefs that may have shaped them to accept and integrate meaningful technology implementation in their teaching practices. The study employed qualitative methods for a comprehensive look into Digital Immigrant teachers and how they may have overcome barriers to technology implementation. In the preceding 3 chapters, I established the need for this particular study, submitted evidence of this need in an overview of the existing literature, and provided the methods I used for data collected.

A total of 207 educators completed surveys via an online platform and 6 final participants were gleaned from this group. The six participants participated in three in-depth interviews, an observation of their teaching incorporating technology, and submitting lesson plans for review, in order to explore digital immigrant teachers and their lived experiences with technology. The findings of the study presented in this chapter are from data discovered through a qualitative lens in terms of each research question.

The chapter contains three sections. The first section gives an overview of each participant. The second section addresses how each participants' lived experiences relate to the research questions of the study and how overarching themes were discovered by

presenting participants with a series of open-ended questions relating to perceptions of their lived experiences with technology. Qualitative data gathered and presented in this section of the chapter offer personal insight from participants relating to their lived experiences with technology. The third section includes a summary of the chapter.

Each participant took part in three separate interviews. The participant chose a date, time and location convenient to them. All interviews were conducted in a private setting and were audio recorded. Siedman's (2006) interview protocol was followed. There was no set time limit and interviews lasted as long as necessary for participants to effectively answer questions and engage in dialogue. Interviews lasted an average of 75 minutes. Coding and content analysis were triangulated and analyzed for recurring themes. These themes were generated in order to effectively address the three research questions framing the study. The research questions guiding this study were:

1. How have digital immigrant teachers' attitudes towards technology in the classroom changed over the course of their teaching?
2. How have digital immigrant teachers use of technology changed over the course of their teaching career?
3. What are the challenges digital immigrant teachers face as they implement technology into their teaching?

Overview of Participants

As previously described in Chapter 3, there were a total of 6 participants in this study. All were teachers in elementary, middle, or high school. All participants taught in a public-school system. The participants were largely female, with only 1 male

participant in the final sample (the participant dropped from the study was also male). Table 1 shows the demographics of each participant.

Table 1

Demographic Data of Participants

Participant	Age	Gender	Ethnicity	Grade Taught	Years of Teaching Experience
Ellen	60	F	Caucasian	Technology Specialist	15
Lauren	44	F	Caucasian	Kindergarten	20
Polly	41	F	African American	Fourth	17
Ledarrius	43	M	African American	High School Engineering	18
Lynn	42	F	Caucasian	Middle School Math	19
Laura	58	F	African American	Middle School Special Education (Language Arts)	16

As the table shows, the participants' ages ranged from 41-60 and included three African Americans and three Caucasians. Five of the six participants were female. One participant was a Technology Specialist who worked with kindergarten through fifth grade administrators and teachers (and often their students), as well as teaching classes at a local university, one participant taught a primary grade, one an intermediate grade, one high school, and two middle school educators, although one of the middle school educators was a special education teacher in a co-taught setting for Language Arts.

Ellen, the oldest participant at 60, had one of the most varied technology experiences, due in part to her current job position and previous careers prior to joining the larger school system. In addition, she had a circuitous route to the world of

education. She initially graduated with a bachelor's degree in History and a teaching certification in history and English for secondary grades, however post-graduation, she briefly worked in a school system, decided it was not a good fit and then worked for the government in various areas and then as a systems administrator for a national bank, then moving on to be an instructor for a computerized learning center. She finally landing with a software company that specialized in creating sales force automation software to be used on laptop computers. She worked for this company for 15 years. After being laid off, Ellen returned to school full time to obtain a Master of Library Media Technology, where she could "combine her love for literacy with her technology skills." Upon completion of her master's degree she worked as a Media Specialist in the larger school system in the study. After 6 years as a media specialist, she returned to school and earned her Education Specialist degree in Media/Instructional Technology. This led her to her current role as a Technology Training/Integration Specialist, where over the course of this job, she has supported teachers at eight different elementary schools. However, due to job related issues, she plans to return to the Media Specialist position for the next school year.

Lauren, while younger than Ellen, has been teaching for longer, as her road to the classroom was a shorter one. Lauren graduated with her bachelor's in elementary education and has taught in two states. Upon graduation, she taught pre-kindergarten at a private Montessori school in Florida, while also working as a nanny for a family with a severely disabled child. After moving to Georgia, Lauren taught 2nd grade for one year in the larger system in the study. Lauren has been at the same school throughout her career with this county. After one year of 2nd grade, she requested a move to kindergarten,

which she has taught for 16 years. After several years of kindergarten, Lauren felt the urge to return to school. Lauren continued to teach full time and attended the local university, in a cohort group and earned her Master of Early Childhood Education. Once she earned her master's degree, she knew she wanted to continue her pursuit of higher education and earn her Education Specialist's degree before she and her husband started a family. She continued to teach kindergarten full time and attended a nearby university where she earned her Education Specialist's degree. Lauren continued to teach kindergarten full time while starting and growing her family. Once her daughters became more independent, she once again felt the urge to return to higher education, because as she stated, she is "addicted to school", and she set her sights on earning her ESOL endorsement and Doctorate in Education. Lauren met her goal and now that she has her Doctorate, is now considering returning to school to become a school psychologist.

Polly is the youngest participant at 41 years old. Polly worked her way through college as an account assistant at a large credit corporation in the area. As a result, it took her 5 years to graduate with her bachelor's degree in elementary education, with a focus on intermediate level, from a large university in the area. After graduating, Polly returned to the larger school in the study as a kindergarten teacher, where she had completed her student teaching, also in kindergarten. Polly taught kindergarten for four years, then math lab, then her current position of fourth grade. During her years with the larger county in the study, Polly worked with the Teacher Quality Partnership (TQP), a grant awarded to the school system and the local university to provide real-life education and experiences for current teachers and teacher candidates. With the TQP partnership, Polly co-taught several courses with a university professor for student teachers in their

final year of teacher prep. She was also on the committee that created the first Math Bowl for Area 2 Title 1 Cobb County elementary students to participate in a rigorous math competition. The competition still exists today and has grown to include more schools. In the fall of 2011, she enrolled in the local university's Instructional Technology master's program. Within that program, she was able to also earn her certification in Online Teaching and completed a digital professional development course as her capstone project. In 2016, Polly acquired her Gifted Endorsement with the school district.

Ledarrius, the only male participant, graduated with a Bachelor's of Business Management, with the intention of joining the corporate world. After graduating, he worked in logistics for a corporate planner. Ledarrius was in charge of shipping for a national conference planning company. While working in logistics, Ledarrius also coached middle school and high school football, as he was heavily involved in sports himself in both high school and college. Sports were a particular passion of his and he found himself enjoying working with middle school and high school athletes. After two years with the conference planner, Ledarrius decided the corporate world was not a good fit and his future path would be education. He returned to school and earned a Master of Business Education. Ledarrius began teaching high school business classes in the smaller system, while coaching various sports. After eight years at this high school, he transferred to a larger high school in the same system, where he has been for the past 9 years. Ledarrius continues to coach while teaching engineering and over the years has coached football, basketball, tennis and golf.

Lynn is unique, in that she is the only participant in the study who has worked in both school systems in the study. Lynn began teaching in 1999 as a math teacher in the

same county in which she grew up and went to school, which is also the smaller county in the study. She enjoyed her time in the classroom, but left for the larger county with a higher salary scale and more advanced classroom technology resources and accepted a position as a high school math teacher. She spent 12 years in this position. During her time at this high school, she fulfilled additional duties by serving as the department chair for several years, mentored new and first year teachers, and spent countless hours as a cheerleading coach. During this time, she also earned her Master of Educational Leadership. Her devotion to her students and the time she spent at school each day, became all-encompassing and time consuming and this, along with her husband's yearlong deployment to Afghanistan, brought her to the decision to leave the profession for a year hiatus when her husband returned to the states.

While on hiatus, she was able to spend time caring for her two young sons, as well as her father, as he battled his final stages of cancer. She was able to "recharge and examine the role she wished to take in the coming year.' She then returned to teaching in the smaller county in the study, as a middle school math teacher. While she knew her passion and purpose could be found in the classroom, her three years back in middle school were filled with challenges and rewards. As a result of those challenges, she found herself once again questioning her role and her desire to continue in the teaching profession and came to realize her calling and preference were with high school students and will be ending her journey along the middle school path and she plans to return to high school in the larger county in the study for the next school year.

Laura graduated with a Bachelor of Journalism, with the hopes of combining her love of photography with her drive to report on the world's happenings. After accepting

free-lance jobs for one year and struggling to succeed in the world of journalism, she entered the Air Force as an intelligence officer. In the Air Force, one of Laura's jobs as an intelligence officer was to help design battles which would then be simulated. The simulations were done through computers that were the size of a laptop, Laura credits her experiences in the Air Force to "opening her up to learning new things and seeing the possibility of technology and what it can do." At that time, she did admit that she did not know how to use Word and similar programs, so she took it upon herself to take classes to learn how to work those programs. After 10 years in the Air Force, Laura joined the aerospace industry, which she credits to "pushing her to learn more technology." Near the end of her 10 years in the aerospace industry, Laura returned to school for her Master of Education. Laura knew special education students were her niche and the integral role technology can play in addressing the needs of students with special needs. She has worked in two different school systems in the state. The first system she worked in eventually adopted a 1:1 iPad policy and she credits extensive training with Apple as building a strong foundation of technology use in the classroom. At this time, Laura continues to teach full time in the smaller county in the study and is currently working on earning her doctorate.

Research Questions Addressed

All interviews transcriptions, observation notes and lesson plans were analyzed in order to identify themes in reference to the three interview questions which guided this study. The research questions were developed to discover the lived experiences of digital immigrant teachers and how they came to integrate technology in a meaningful manner in their instruction of digital natives. Themes were identified and supported through the

data. 20 codes were initially used when open coding took place. This number was then reduced to 17 during axial coding and then to 11 codes during selective coding. Table 2 identifies the final codes from selective coding and their groundedness in the study. The groundedness refers to how often a code was used/identified when analyzing the data. According to Saldaña (2008), codes are identified to "represent and capture datum's primary content and essence" and these codes can be used to summarize or compact data (Saldaña, 2008), which then develop the themes of the study, which can then address the research questions guiding the study.

Table 2

Final Selective Codes of Study

Code	Groundedness
Challenge	249
Self as Digital Immigrant	204
Impetus for Use	184
Use	173
Digital Native Students	165
Impact of Use	137
Staying Current	102
Support	90
Catalyst for Change	84
Digital Native Colleagues	59
Digital Immigrant Colleagues	42

As Table 2 illustrates, Challenges was the code with the highest groundedness, with 249 occurrences throughout all the documents coded. Self as Digital Immigrant also showed a high incidence of occurrence, with 204 uses, which is not surprising, as the study examined the lived experiences of Digital Immigrant teachers and their use of technology. Use included both beginning use of technology and current use of technology. Impact of use included success experienced. The code Support included both support experienced, as well as lack of support.

Research Question 1: How have digital immigrant teachers' attitudes towards technology in the classroom changed over the course of their teaching?

All the participants in the study, with the exception of Laura, had limited early experiences with technology, which may have impacted their attitude toward technology integration in their early years of teaching. Many of the participants began their teaching career with the attitude that technology was useful for low-level tasks and mostly for teacher use. However, both Ellen and Laura had career experiences before joining the arena of education, which may have had a positive effect on technology use early in their teaching career, as they are the only two participants who worked in other industries before teaching full time.

Ellen's earliest experiences with technology were inauspicious at best. Not only is Ellen the oldest participant in the study, but she had the least exposure to technology early in life. Ellen recalls being in elementary school and her father, an engineer, telling her she should major in computers when she went to college, because that was the wave of the future. At that time, Ellen had the mindset "that the computer program required you to be good at math, so that automatically… was me saying 'Oh yeah. Yeah, count me

out!'". Other than a cassette recorder as child in early elementary school, which was new technology at the time, Ellen's first experience with technology and computers was not until college, when she had to take a required computer programming course, "and it was horrible! I don't know how many ways I can say that strongly enough!"

Out of college, Ellen worked in a job where she used a computer solely for word processing, but eventually she came to work for a school that had instructional software and she began to work hard to self-educate and get past her dislike of technology in order to use the software. However, after a couple of years, it was her move to a software company that provided the catalyst for change in her ideology about technology and her capabilities. Through her 15 years at the software company Ellen was able to develop and hone her use of technology. When her time at the software company ended, Ellen know she wanted to return to the world of education. "I wanted to get back into education and I just wanted to do something where I could use my technology skills…. The media specialist job had sort of shifted into a more technology-centered role."

After returning to school to earn her Master of Media, she joined the world of public education and has not looked back since. If her idea as self as Digital Immigrant in college was that she was less than capable with technology, her software company experience bolstered her self-confidence. When reflecting on her experiences at the software company, she remembers having an epiphany when finally understanding a process she had been having a difficult time understanding, "Technology is so much about your attitude towards it." Her years at the software company, in conjunction with earning her master's degree, served to build a new foundation and transformed her into a Digital Immigrant who felt she was fully capable with technology.

> I felt like I had that *something* that not everybody had and so that was gonna make me be able to get into the job quicker and more effectively…and I think I realized when I got there (the Media Specialist job), it was just a whole set of technology that I hadn't really known about, but I felt..but I didn't have that fear. So many teachers have that fear of trying it 'cause they think they're gonna break something, but I was not ever shy about just jumping in and trying it and figuring it out for myself.

Along with a fresh sense of self as a Digital Immigrant who was more than capable of using technology, Ellen came to believe the use of technology has also made teaching more enjoyable and engaging for her students and it is something she cannot imagine teaching without. This is quite a transformation from the young girl and then woman in college who once thought she would never use a computer. "…growing up, I never thought I would use technology every day…and embrace it so much…I can't imagine going back to teaching without it!"

Lauren, unlike Ellen, who is almost a generation older than Lauren, remembers computer use much earlier in life and being open to the experience. Lauren experienced using a computer at school as early as second grade and using a word processor in college. Lauren also remembers her junior year of college when "the World Wide Web became 'a thing' and my parents bought me my first computer."

At the beginning of her teaching career, Lauren was able to experience technology in the classroom with 10 Apple desktop computers. At that time, student use was limited to a select few programs that were intended to be educational, but looking back, Lauren recalls, were mostly for entertainment factor. "…the computer programs

themselves were probably of little use, but my students that year learned the basics of computer use and care…most of my students back then had limited experience with home computers." She taught her students how to insert the floppy disks and power down the computers at the end of the school day. As her students did not have access to computers at home, she remembers there being a learning curve for both her and her students alike.

In contrast to Ellen, Lauren's attitude toward the use of technology has not necessarily changed over the course of her teaching career, but rather has strengthened in the belief in the importance of integrating technology. Lauren recognized technology for the valuable resource it was and the role it played in the classroom. She recalled a steppingstone to using it as to being able to determine how best to use it and what did and did not as meaningful integration. When looking toward the future of her career in the classroom, Lauren said

> Technology is not going away; it is only evolving and morphing in various ways and will continue to do so in the future. I believe that as a society we are going to continue with our use of technology as it invades every single aspect of our lives. Classrooms will not be any different…I definitely see myself continuing to learn, grow, and stretch and find new and better ways to use technology to help my students master standards.

Polly, while the youngest participant in the study, did not have much exposure to technology as a young child, due to her family's size and socioeconomic structure. "…my early experiences with technology was pretty limited, because even the technology that was available wasn't something we could afford." Whereas Lauren

experienced technology in the form of a computer lab in second grade, Polly did wonder if her parochial school years were an additional factor in her limited technology exposure and experience, as the budget and resources were limited compared to public schools. She did remember a technology of the time, that many other participants mentioned, that of the film strip projector.

When beginning her teaching career, Polly stated, "When I first started teaching, it's not like there was a ton of technology like we use today" and as a result her access was limited. The technology she did use was low-level and teacher-centered. She used the available technology to make her life easier. The school, while in the larger system of the study, at that time had limited technology resources available, although there was a computer lab and some computers in the library for teachers to use. She used this technology for word processing tasks, such as lesson plans or hand out for the students, rather than handwriting them. This made sharing with other teachers easier and more seamless, but involved low-level use and did not involve any student use of technology.

It was not until the school system itself shifted to incorporating more technology for student use and providing support that Polly began to see the benefit of integrating technology into her teaching for student use. Polly was also hearing more and more students talk about technology use outside of school and how it caught their attention. After hearing students talk about the Wii gaming system and how engaged the students seemed to be with it at home, Polly worked in the After School Program in order to afford to buy the system herself. Polly wanted to incorporate the students' interest in the game into their classroom life, so she set up an incentive program. She set up a point system with her class and point were earned for: turning in homework, positive hallway

behavior, positive behavior in the lunchroom. When the class met the point goal, Polly would bring her Wii game in twice a month on a Friday and they class would spend 30 minutes playing the games. This in and of itself came with challenges for Polly and the class. Not only did Polly have to get principal and parent approval, but it was also time consuming to sign up and check out a carted television from the media center and get it down to her room. In addition, the class also had to brainstorm to come up with a system where they felt game time was fair, as points were earned as a class and everyone wanted a turn.

> …and believe me, 4th graders are all about what is 'fair' and they would not settle for anything that seemed like someone was getting more time. They really did a great job of figuring out how to get everyone some time during the two times a month I brought the game. And, a side effect was how much fun the class had, cheering each other on when they weren't the ones playing!...it was an incentive for the kids…it wasn't so much a part of my 'teaching'…but I would call it low-level.

From that point on, Polly recalled it being a progression of changing her mindset to make the change from teacher-centered use to a more student focused approach to using technology in her teaching. Polly worked hard to learn how to incorporate technology, as she was seeing the impact it had with her students, "my students were so motivated and engaged with technology use." While a Digital Immigrant herself, Polly was still younger than many of her colleagues, who were not "terribly interested" in learning new technologies and as such, she took it upon herself to be the one they could come to with a question. Presently, Polly strives to continue to grow and learn with

technology. As technology changes, so do her students and it is her belief it is vital to stay current. "Technology isn't going anywhere and neither am I, so there is no other choice but to keep up with the changing face of technology."

Ledarrius grew up with limited exposure to technology, but remembered the computer lab in third grade summer school and video games. College brought experience with word processors. Like Polly, he was from a big family where the resources to buy technology were scarce. In college, Ledarrius would have to travel to the computer lab on campus and it was a laborious process that did not endear technology to him. Eventually, he bought a used computer, but his early experiences "were very limited, due to availability and cost."

During his early years with the smaller county in the study, Ledarrius did not use technology, nor consider it an important component of teaching. As in his early years, this was in part due to availability and cost. As the county added available technology, Leddarius, like Polly, utilized it for low-level, teacher-centered tasks. He was not an early adopter of technology, but came to see technology could be used "to help enhance storage of and presentation of curriculum…I could use it to make my job easier once things were around for a bit." He did not have a computer at home, so he was also limited to technology use that was tethered to the school building, but he was content to use it for tasks that "made his life easier".

Leddarius credited training from the county for instigating a shift in his attitude toward technology and its use. However, he reflected that the initial training support offered by the county, while encouraged use with students, it was not for high level tasks, but for similar tasks for which he was using the technology. As he saw the students using

it, even for low-level tasks, he saw a shift in his students' attitude toward technology use. He observed the students become more excited, more engaged, and even their increased interactions with each other. "…it was the students who helped me see how important technology use is, even when we were using it for what we now know were low-level tasks."

As county training continued and more technology became available, Ledarrius continued his commitment to stay abreast of technology use with students. He also acknowledged the change from himself being the driving force for use, to his students being the reason for continued use.

> We have to make it relevant and engaging for the students. It's not like it was when we were growing up. We just sat there and the teacher, professor, even let's face it, our parents, lectured us and we listened…and spit the information back out. It's not like that anymore. Technology is a vital tool to my teaching, and I don't ever envision teaching without it as a cornerstone of my instruction…Looking back, I started to use technology to make *my* life easier. It wasn't about the kids. It was about me and productivity.

Laura, closer to Ellen's age than the other participants, had similar school experiences with technology, in that a film strip and overhead projector were technology of the day. However, her home life was quite different, particularly for the time, and she had a much different experience with exposure to technology at home, Laura's father was an engineer who worked in the space program and the family was able to visit him at work and take tours during Open House nights for families. Laura recalled how the computers were so large, they would take up an entire room. Her dad brought home

schematics and designs and work on them and would talk to Laura and her sister about his work. Laura recalled an early computer, KIM (Keyboard Input Monitor) that she and her sister could program with a calculator and play games. The computer at that time was large and rudimentary, with no screen on which to display information.

During her time in college, computers and even cell phones were not available for the general public. Laura earned a degree in journalism and stated her technology use at the time was non-existent, other than a few multi-media classes for broadcast journalism. However, Laura joined the Air Force as an Intelligence Officer and one of her jobs was to design battles, which would then be simulated. This involved quite a bit of technology that would hook up to a satellite in order to get a real time feed of the battle area. Laura would then guide the planes where they needed to go. The technology she was using then may be considered crude now, but was cutting edge at the time. Laura credits her time in the Air Force and her experiences there with opening her up "to and learning new things and seeing the possibility of technology and what it can do…I've always been open to the use of technology and I think it helped me as compared to some other older educators that maybe shy away from it."

Laura acknowledged that her knowledge of technology at the time was very job specific to the Air Force. When she joined the aerospace industry, she had to learn a new set of technology skills such as Word and Excel. As these were skills she was already expected to have mastered, Laura had to take the initiative and teach herself, building upon her already strong foundation of technology.

When Laura came to the educational arena, her background with technology helped her incorporate it into her teaching. Laura also credits support and training the

staff received in her first teaching job as a lynchpin to success in using technology in a meaningful manner. “I could see the potential that it can give to the students…I was able to see the bigger picture of things and how it [technology] could help the students make those connections.”

Lynn’s early experiences with technology were similar to Polly and Ledarrius, in that while some technology was available at the time (i.e. Walkmans, VCR, etc), it was not something her family could afford. Similar to other participants, she used a word processor in college, but recalled it was basically a glorified typewriter. As a result, “I wasn’t very comfortable with technology, so I wasn’t the kind of person who was going to seek it out.”

The same could be said for the beginning of her teaching career. When she began teaching in 1999 in the smaller system in the study, “my technology was limited. Back then ‘technology’ was a dry erase board and an overhead projector. That was my ‘technology’, so compared to today, it was very basic.” When she did use a computer, it was for low-level, teacher-centered use, such as creating quizzes or handouts for the students. However, she often found the technology available to her frustrating and while she found personal uses for the computer, “as far as teaching…I pretty much didn’t use it for teaching purposes…it was limited and filled with frustration…”

It was not until Lynn moved to the larger system in the study that she found herself opening up to the use of technology and its benefits. The larger system had a more prolific technology base and students who were not only well versed in its use, but expected it to be used. This was new territory for Lynn, who had limited use up until that time and a closed off attitude toward technology use in her teaching.

> …I was pretty scared of it at first. I mean, what if I broke it? It was so foreign to me that I was very trepidatious. I would say at first, I definitely stuck to my comfort zone of the overhead projector and used the SMART board for its most basic functions-a glorified white board…there was just so much to learn at one time that technology kind of went to the back burner for a while.

It was through sharing a room with another teacher that Lynn slowly began to see firsthand the benefits of technology use with her students. While Lynn was in a planning period, the other teacher would be teaching a class and Lynn was "able to learn a lot from her." She and the teacher she shared a room with began collaborating and trying new things together and Lynn was pleased and encouraged with the successes she experienced.

When returning to the smaller system in the study, Lynn did not have the technology resources she did in the larger school system, but continued to use the resources available.

> Technology has become an integrated portion of my teaching…it's so weird to reflect back on where I started with technology a with your first few questions and where I am now. It was so foreign to me then. But now? I can't imagine teaching without it

In the course of this study, it was found that all the participants now have the attitude that technology is a valuable resource and integral to their teaching and student engagement. While half of the participants started their careers a positive attitude toward technology use, the remaining three participants experienced a shift in their attitude toward technology use. Participants Polly, Ledarrius, and Lynn did not have positive

experiences with technology to serve as a foundation when they began teaching, whereas Ellen, Lauren, and Laura, to differing extents, all had some experiences that built a strong sense of how important technology use is in their teaching. The participant who experienced the most dramatic shift in her attitude toward technology was Lynn. Lynn started her teaching career opposed to using technology, used it sparingly, begrudgingly, and for low level usage. Presently, all participants consider technology to be an integral part of who they are as teachers.

Research Question 2: How have digital immigrant teachers use of technology changed over the course of their teaching career?

In the course of this study, it was found that all the participants have changed their use of technology, although some not as drastically as others. As seen with research question one, Ellen, Lauren, and Laura began their teaching careers using the technology available to them at the time, which reflects their beginning attitudes as was seen when examining research question one. Ellen and Laura, both began their career in teaching later in life, after other careers with heavy technology use. Lauren had more experience with technology when she herself was a student and was then fortunate enough to have a large number of computers for student use in her first classroom. Their use at the time was limited only by what was available to them. In contrast, Polly, Ledarrius, and Lynn began their careers with little use of technology, even with what was available at the time. All participants experienced a shift in technology use and while technology can still be used for low-level tasks, higher level tasks are more so the norm for all participants.

When examining the data for research question two, I considered the LoTi framework as a starting point and considered the data through this lens. I examined participants starting use of technology and then compared it to their current technology use. The LoTi framework is explained in detail in chapter three. It has a range of zero (Non-Use) to six (Refinement).

Ellen, having worked for a software company before becoming a Media Specialist when she returned to education, was the study participant with the highest technology use at the beginning of her teaching career. That is not to say, her use has not changed and become more proficient over time. Ellen's use of technology at the beginning of her teaching career would have been a two on the LoTi framework. She was comfortable using technology with students, but tasks were more of a replacement of paper and pencil, rather than student-centered use or use of multiple technologies being used.

As Ellen progressed in her career leaving her Media Specialist position for a county technology support role, her capabilities and proficiency with technology have continued to grow by leaps and bounds. When looking at her survey responses, it was indicated she was using technology at a level five. During interview two, when discussing a self-ranking, Ellen stated,

> So much of what I do as TTIS depends on who I am working with and what their end goal is. So, sure, as a TTIS, I can rate myself anywhere from a two to a six, but so much of that depends on who I'm serving….in my current role, it's really varied…some teachers aren't ready for me to support them at a level five or six, so I have to meet them where they are. Now, when I go back to work as a Media

Specialist next year that will all be on me and I see myself starting at a four to five with the kids.

This varying level of technology implementation was supported in our interviews, the observation of Ellen supporting teachers in the classroom and in her general job duties and responsibilities. Ellen is a unique participant in that she not only teaches students and teachers and administrators, but she also teaches courses at the local university, so her technology implementation range varies depending on her student population. With a beginning of teaching rating of two on the LoTi framework, at this point in her career Ellen's technology implementation falls anywhere from a four to a six.

When examining what motivated Ellen to continue to increase her implementation, while increased availability of technology was a factor, it was clear increased student engagement was the driving force. "I knew the kids were gonna enjoy the lesson more if I had technology in it…I tried to use it as much as I could to make it authentic…not just technology for the sake of using it." Ellen's philosophy centered around the use of technology to "Ensare" students and promote engagement. A different factor driving technology use for Ellen, which will be addressed later in this chapter for research question three, was that her Digital Native students expect technology to be a part of everyday teaching and learning. Ellen stated she feels most successful using technology when the students (whether those students are elementary school students, teachers, administrators, or university students) get more out of an experience than they would have with a paper and pencil task and this is what drives her to stay current with technology trends and implement technology in a meaningful manner.

Lauren began her teaching career with a different advantage than the other participants, with the large amount of Apple desktops and training support in her room. At the beginning of her career, Lauren's use of technology would have been a two on the LoTi framework, as the students used the computers, but it was for low-level, game/entertainment use and Lauren used technology for teacher-centered use. This was in large part due to what was available to her at the time and not a lack of impetus for use. Lauren worked to involve her students as much as possible with learning the available technology (i.e. teaching them how to insert the floppy disks, assigning student jobs for starting computers at the beginning of the day and shutting them down at dismissal). As she progressed through her career and technology became more readily available and she took advantage of training, Lauren's use of technology changed to a more student-centered philosophy.

When looking at her survey responses, it was indicated she was using technology at a level four. This was supported through interviews, classroom observation, and lesson plans. Lauren, echoing Ellen, stressed that use is not a static number, particularly at the beginning of the year in kindergarten, when her technology use would fall lower on the scale at a two to three. She begins the year with more teacher driven technology tasks and scaffolds the students until they are ready to take on more of the problem solving and decision making.

> …there are times, especially at the beginning of the year, when we are much more teacher-centered, as the kiddos have to be introduced to rituals and routines…this is done by the teacher…my main focus is on student-centered, but this is something that happens gradually as I integrate the students into life in a

> classroom…may of our students have never stepped foot in a classroom…we definitely ease into it with a lot more teacher directed activities at the beginning of the year.

While student engagement was a definitive factor for ensuring her use of technology with students was keeping pace with the times, an early factor for Lauren to make sure she did not stay with teacher-centered technology use was watching a colleague, a fellow Digital Immigrant, resist using technology. The encounter resonated with Lauren, as this colleague was someone to whom she looked up to; a mentor to Lauren. She stated the conversation she had with her mentor stood out to her as a turning point and she realized she had to "up my technology game and find ways to truly incorporate technology into my classroom in a way that was effective and valuable, rather than …to put a check in my box on my evaluation."

When striving to use technology authentically, rather than as an expectation on her annual evaluation, her Digital Native students are a driving force for Lauren. When looking at her students, who have never known a world without advance technology, Lauren acknowledged an antiquated approach to teaching and learning will not resonate with her students "who are basically born with a device in their hands." She has seen technology morph and evolve and realizes it will continue to do so in the future and that educators must keep pace in their classrooms.

Polly began her teaching career with very limited access to technology and her beginning use was a zero. When she first had access to technology, she used it for teacher-centered use at level one. While she did buy a Wii gaming system to also use with her students, she had this to say, "…it was an incentive for the kids; a fun way to be

rewarded for good choices…it wasn't part of my 'teaching' in the strictest sense. I would call it low-level." As the county she worked for increased access to technology, she worked hard to keep pace, but acknowledged she did not branch out from what the county pushed down, but "if it was available at my school, I tried to learn how to use it."

For current use, when looking at her survey responses, it was indicated she was using technology at a level five on the LoTi framework. However, what was gleaned through interviews, classroom observations and lessons plans would place her use at closer to four. This discrepancy could be due to self-reported bias or as Ellen and Lauren stated, technology implementation should not be a static number on the LoTi framework, and her self-rating may have been her summative use from past teaching experiences.

When using technology with her students, Polly keeps in mind there should be a real-world application component to every activity and reach beyond the classroom. Polly believes this is a key to leading to student engagement. Polly stated,

> If there is a real-world reason behind it, they are far more likely to engage fully…[but] it's hard to have outside communication incorporated regularly. It's also hard to move to a completely student-centered way of teaching, when the standards are so rigorous and standardized testing is always a factor to consider. There is so much that has to be covered that it is hard to trust that student led questions and lines of inquiry are going to lead to the required content being taught and…to the depth necessary.

Ledarrius, like Polly, began his teaching career with little access to technology in the classroom. His beginning use of technology was zero on the LoTi framework. As more technology became available for use, he moved to level one implementation.

Ledarrius was transparent that his beginning technology use was not about the students, but about making his life easier. He used the available technology for storage and presentation of curriculum. He eventually moved to using technology for grading purposes as well. For a time, he continued to use technology for level one uses and

> to help manage teacher tasks …I was presenting information to students who passively received it. But that's how all our training was focused. When I first started to use more technology in my teaching, it wasn't the interactive tool it is today.

However, the more he used technology and taught with it, he became more comfortable and encouraged with how engaged his students were when he was not using it for low-level purposes. Ledarrius reflected that as he was making this shift, the training provided by the county was also shifting away from low-level teacher use and moving toward student-centered use. He cautioned that at that time, the training did not have the same focus seen presently, but it was a starting point for student involvement. As Ledarrius involved the students in using more technology, even at low levels, he saw a shift. His students were more engaged and excited about learning. The students were able to interact and collaborate with each other in a more meaningful manner that was not confined to the four walls of a classroom.

Ledarrius credits his Digital Native students and the positive results he saw with them, even at a low level of technology use, as the impetus for realizing the important role of technology integration. When looking at his survey responses, it was indicated he was using technology at level five in the LoTi framework. This was supported through interviews, classroom observation, and lesson plans.

When reflecting on his technology use and the transformation it has undergone throughout his teaching career, Ledarrius shared that for the first 10-15 years, he felt like he and the students were learning the technology together. "We were taking baby steps together. We had a common language, and common skills." He also said he noticed the roll out of technology was slower 10-15 years ago and his Digital Native students can be credited as a resource to help him with the faster pace of technology, allowing him to keep his technology use higher on the LoTi framework.

Lynn started teaching when technology was a white dry erase board and an overhead. She had a computer at home, but used it almost exclusively for personal use. Calculators for her math classes were scarce and she found technology frustrating and often easier to not use at all. Her beginning level on the LoTi framework was zero.

In the early years of her teaching in the smaller county in the study she stayed in her comfort zone of little to no technology use. Like Ledarrius, she was using technology "for my purposes and to-make my life easier as a teacher and it was pretty limited and low level.". As she settled into working in the larger county in the study, she found herself with more technology and support available. She admitted to initially feeling overwhelmed with "how far behind she was" compared to the other teachers and even her Digital Native students. According to Lynn,

> I mean, when I first started teaching, there wasn't that big of a gap, but the students at [the high school] knew more about the SMART board than I did, because, for the most part, they had been in the schools with the technology and learned if from other classes and teachers, so I was at a definite disadvantage there. Of course, there was always an intimidation factor, but I just blamed it on

> my 'old age' …and the kids were cool, and for the most part, didn't hassle me too much about it…but at first it *was* intimidating….sometimes frustrating when I was trying to figure out how to teach with the technology and it was out of my comfort zone.

As she observed the teacher she shared a room with and her meaningful technology use, she began to slowly make changes to incorporate more of the advanced technology now available to her. As she took "baby steps" to building her technology use and moving up the LoTi framework, Lynn began to feel more confident in her technology use, which encouraged her to continue to learn and grow. She often found herself learning from not only her colleagues, but her Digital Native students as well. After taking a hiatus, Lynn returned to the smaller school system to teach middle school math. Although the smaller system had made gains in available technology in her years away, it was still behind where the larger system was in technology availability and use. Lynn stated her self-ranking on the survey, was constrained due to lack of access in her present school system, and would have been higher, were she still teaching high school in the larger study in the system. When looking at her survey responses, it was indicated she was using technology at level three in the LoTi framework. This was supported through interviews, classroom observation, and lesson plans.

Laura, much like Ellen, came to education after several other careers. However, unlike Ellen, her early exposure to technology was rich, due to her father's career in the space industry. Laura's careers in the Air Force and the aerospace industry both involved heavy technology use. When it came to her teaching career, Laura was only limited in her technology use at the beginning by the available technology in the school system in

which she worked, or lack thereof. Her beginning use was between two and three in the LoTi framework, due to the confines of the available technology.

When that system went to 1:1 iPads for students, the staff and administration received "strong support of proper training", which served to further strengthen Laura's abilities and confidence in using technology in a meaningful way in her classroom. Laura credits this training she received from Apple as laying the foundation of her knowledge of educational software.

Laura, as an early adopter of technology, reflected about how she has also been driven by student need and how she could best support her special education students. "A lot of times it was more of a: this [student] struggles with *this*. Let me find some technology that will help them." Her use of technology has,

> added dimension to my teaching, because it gives me different ways to let the students show me what they know, instead of just writing an essay…They usually wind up, or they're able to tell me, more about what they know than if they just write it because it can tap into their creativity side as well and they're still writing a piece with that, but they can use pictures and that kind of stuff…the main thing it has given me a lot of different ways to help the kids show me what they know.

Laura's survey results indicated her LoTi level at four. This was somewhat supported through interviews, classroom observation, and lesson plans. However, higher use at five was also observed in classroom observation and lesson plans and in narrative in interviews. As has been stated, the smaller school system has less technology available and it is my belief Laura's level in the framework could be six, were she to have more resources available.

In paralleling the results from research question one, three participants started with technology use that could be considered above average for the time, but all participants experienced a large shift in technology use. Ledarrius and Polly, again as found with research question one, are the participants who experienced the most change, with Wynn following closely behind. All the participants made strides in integrating technology in meaningful ways from the beginning of their career to the present, even the three participants who started at a higher level than most for the time. When examining the driving force of the change, the shift from low-level use to a more complex use for all was driven by the desire to meet students' academic needs and increase student achievement. Some participants needed more scaffolding and guidance than others to make this shift. Half of the participants had the advantage of working in the larger system in the study, where more technology and support was available, leaving the other half at more of a disadvantage with a more limited access to technology. Despite these differences, all the educators in the study remain committed to staying current and continuing to integrate technology into their teaching. providing their students with the highest quality

Research Questions 3: What are the challenges digital immigrant teachers face as they implement technology into their teaching?

All teachers face challenges in the classroom, from newbies to veterans, no one is immune. However, as technology continues its rapid advancement, technology can be an insurmountable challenge for some, particularly digital immigrants. As Table 2 indicated, Challenges was the most coded item with 249 occurrences. There was not one interview where participants did not bring up the challenges they face as Digital

Immigrants who teach Digital Natives. Chapter Two discussed Ertmer's (1999) and first and second order barriers to teachers' technology use. First order barriers are extrinsic to the teacher, such as lack of availability, time, training, or support (Ertmer, 1999). Second order barriers are intrinsic to the teacher and include technology beliefs, pedagogical beliefs, and teacher willingness to change (Ertmer, 1999). The teachers in the study were all committed to pushing through their second order barriers in order to implement technology in a meaningful manner in their teaching. As the following will illustrate, most challenges were overarching with all participants and were first order barriers, outside of the teachers' control.

All participants, regardless of their LoTi level and current use of technology had the same overarching challenges as their biggest obstacles. As discussed above, this challenge is a second order barrier and one the researcher found to be surprising. All participants viewed their digital native students as posing the biggest challenge. The reasons for this ranged from students' attitude of expecting technology to be used and for it to be entertaining, to their short attention spans, to their expert use of technology for entertainment but not for authentic educational use. After digital native students, a common challenge experienced by all participants was the element of time. The challenge of time was an obstacle that encompassed the time needed to keep pace with the rapid changes in technology, but also the time to fit technology into a daily schedule. Challenges also came in the form of access to technology, although this did was more of a challenge for pariticipants in the smaller system in the study.

Ellen, again is a unique participant in that her "students" encompass elementary students, teachers, administrators, and university students. One of the biggest challenges

Ellen faced was Digital Native students themselves and their attitude and approach to technology use in the classroom. Ellen, along with all the other participants in the study, with the exception of Lauren, has seen that students *expect* technology to be used in the classroom. Part of this expectation from students goes hand in hand with their attitude that the use must be entertaining and/or game like. Ellen had this to say, "I think they just expect it now…because they've all known …technology, they're digital natives, they've known it forever…so entertain me, teacher!"

What Ellen, and other participants have observed, is that while students want to, and are able to, use technology for entertainment purposes in a capable manner, they are not necessarily more tech savvy. Ellen stated,

> They want to be entertained and I don't think that these kids are more tech savvy than kids 10 years ago, because I don't see them as troubleshooters if there is an issue or a glitch. They know what buffering is, but don't know what to do if something is stuck buffering. So, they want the game aspect, but not necessarily the usefulness aspect.

Ellen noticed this across the board with her elementary and university students. Her students have more of a gaming aspect knowledge, but not a deep knowledge of the functionality of the technology they are using, and this can be a frustration point for Ellen.

Coexisting with this expectation to be entertained by technology, Ellen experienced her students' attention spans (including teachers) to be shorter than when she first began teaching.

> Everything has to be instant, instant, instant! They don't have a very high tolerance for not being able to 'get' a technology, because they are used to playing a game and it's easy and they're 'getting it'….I see that with the majority of younger students [including university students] and teachers who are young…they don't have a high tolerance for something that might require they actually engage their brain a little more. They see technology a lot of times as a toy and something to kill time.

Particularly in her role as TTIS, Ellen is able to meet the challenge of presenting entertaining, yet meaningful, technology to students, but that is not always the case when her students are teachers. In her experience, teachers are not captivated by the technology she must teach them for county mandated assessments and productivity tools. In order to overcome this challenge, Ellen takes the same approach as with her younger students and makes those lessons as fun and engaging as possible to get teachers' attention.

In order to meet this challenge, Ellen must face another first order challenge: that of keeping current with technology and the time it takes to do so. In her role as TTIS, there is some time structured into her day for research, but there are only so many hours in a day and so much to accomplish. Ellen acknowledged this to be even harder for teachers, as their schedule is not as flexible as her current one. Ellen is constantly trying to find more time to stay current in order to meet the needs of her students and mentioned she sees this as a bigger challenge when she returns to the Media Specialist role in the coming school year.

A challenge Ellen reflected upon that was not similar to other participants may be due to the age of many of her students and that is how she sees herself as a Digital Immigrant. Her thoughts on self as a Digital Immigrant only came up when she was discussing her adult students (university students, teachers, and administrators) and colleagues in the TTIS department, not when her students were elementary school age. When referring to her university students and how she thinks they may perceive her, she had this to say, "I think they think, 'You can't teach me anything I don't know about technology lady.'" Which has led her to feel "…God, I feel like such an imposter sometimes when I stand up in front of these students and I'm like, 'Let's see if I can pretend like I really know what I'm talking about here'". She has also felt this same attitude from some of her Digital Native colleagues in the TTIS department. When she first took the position, there was skepticism from some younger colleagues that she would be able to "keep up". As a result, she has felt the challenge and pressure of proving her worth and technology knowledge and has worked hard to stay current.

Lauren stated two first order barriers as challenges, "…availability and access are the two biggest obstacles I face on a daily basis." She also cited time as a challenge, but said that was a constant challenge in teaching and not solely related to technology. While Lauren works in the larger county in the study, she sees more technology resources being funneled to the intermediate grades, with kindergarten somewhat given the leftovers or being an afterthought. This also appears to be the case with the software the county pushes down to iPads through the Software Center and she had this to say,

> Most of them seem geared toward older students and not my five-year olds. That's a point of frustration-we all know the younger we can get kids involved, the better, but the higher ups don't seem to follow that line of thinking

She would like to have the ability to offer more "individual opportunities for students to interact meaningfully with technology while in small group rotations", but shares and iPad cart with three other kindergarten teachers and the two desktops in her room do not function well enough for student use.

Lauren felt teaching students who are constantly immersed in technology can be a challenge. However, Lauran also viewed this dynamic as a reminder that times are constantly changing, and it is education's job to keep pace. An aspect perhaps not seen in older grades offers another challenge for Lauren when using technology with her students. At the beginning of the school year, her students, while Digital Natives, are only four and five years old and constant scaffolding and time to learn school related technology. When referencing how to teach her students how to play Kahoot! Or SMART Lab games, she said

> …there is a biiiiiiig adjustment at the beginning with both of those kinds of games, because the kiddos have to know how to log in, whether it's with a code or a code *and* a name, and it takes a lot of time and manpower to get all of that done at the beginning…all worth it in the end, but man! Every time it makes me want to pull my hair out! Even with a full-time para, with 20 students? We can't be everywhere at once and the kids will just start randomly pressing things. I have to remind myself every year that the hassle is worth it in the end. The students learn and have fun doing it.

When working to overcome challenges and stay current, Lauren's biggest motivator is remembering her mentor and other veteran colleagues who resist technologies advances. Her attitude of "never wanting to be afraid of technology…or be so intimidated by it that I avoid using it" has helped her keep pace. Another factor Lauren considers when keeping pace with technology is her own children and their technology use. "As a mom…teacher…global citizen…the only way we can hope to have a successful generation of students enter society in a few years is to provide them with meaningful technology-based experiences."

Polly, out of all the participants, seemed to express the least amount of challenges. Her two biggest challenges of access and time are also first order barriers. The challenge of access matched one of Lauren's challenge and this could be due to both of them being in the same school. Polly expressed her Title I school did not have as much technology as other schools in the county, where perhaps PTAs and Foundations contributed to the technology base. "Having to manage sharing with other teachers or dividing a handful of devices among my kids is hard." This challenge can be difficult to overcome, particularly when Polly attends a county training and the training is presented as if all students will have a device in their hands. In order to meet this challenge head on, Polly worked to be very deliberate in her planning.

> I find that to pull of technology on a large scale, I have to be intentional. I have to work ahead and make sure I have scheduled time in labs or with carts. I can't change my plans lastminute and come up with a technology-based lesson because I can't ensure that availability of technology I want to use and that's frustrating, because sometimes there are those teachable moments that pop up and I think,

> ‘Oh! This would be a great time to have them all record this, but with three desktops and a shared iPad cart, that’s just not possible.

As with Ellen, a challenge Polly faces is time. When Polly referred to time, she did not only refer to the time it takes to stay current. She included the time needed to plan to use technology, the time it takes to receive training, time in the day to teach the students how to use new-to-them technology, and she included the time necessary to collaborate with colleagues or Ellen.

As she was reflecting on the challenge of time, Polly realized a third challenge that had not initially come to mind, and this is a challenge Ellen also faced. This challenge was the Digital Native students themselves. As Ellen expressed, Polly’s students want technology use to be entertaining, as it is when they use it at home. Polly has observed that her students are so used to having a device in their hands, that they often seem lost when they come to school and have empty hands. When it is appropriate to use technology, Polly works hard to find tools that are meaningful and will enhance their learning and is appealing to students. “They are pretty resistant to technology they don’t view as ‘fun’…they have a ‘gaming’ mentality…otherwise then tend to stick their noses up at it.”

Ledarrius shared the challenge of time with other participants, but also added the challenge of discerning what technology is worth learning, which is interrelated with his challenge of time. When discussing this challenge, he stated,

> It needs to make teaching easier for me or better for my students or ideally both. Some claim to fit into one of these categories but end up not really working. This challenge is difficult to overcome if you want to use technology well. Time is also

> a challenge, because figuring out what's worth learning takes time. With teaching, coaching, being a working parent, I have a lot of demands on my time…It's not that I don't want to invest extra time, but there's got to be a work/life balance.

Ledarrius felt his county better supported teachers with the challenge of time in years past, but not presently. What teachers used to have as "teacher workdays" are now "professional learning days". In Ledarrius experience, what his county considers support in professional learning days is not meeting his needs and is taking away his time to work on what is worth using in the classroom.

A challenge Ledarrius had in common with both Ellen and Polly, was the challenge of teaching the Digital Native student and the shift he has seen in students from the beginning of his teaching career. "…something I see with students is that they want to use technology for entertainment sake and not learning." Ledarrius brought up a point related to Ellen's thought of students not knowing the ins and outs of how technology actually works when he said,

> …they will use technology to look something up, but then they don't know how to evaluate the information they have found as credible/valid. It's something my colleagues and I have talked about seeing more and more…there's a positive there in that there's a teachable moment when that happens…But a challenge I have with that is that they often have this attitude that because they are younger, they know the technology better. They don't get that being able to Google something faster, doesn't mean you know technology better.

Ledarrius referenced reduced attention spans and the student expectation of school being entertaining, as did Ellen and Polly. With students immersed in vines, Snapchat, and Tik Tok, with snippets that move quickly from one to the next, Ledarrius has seen a "definite demarcation between students today with this mindset and those of 10 years ago." Ledarrius addressed this by saying he works hard to keep lessons engaging hands on, and project based, but it is also his job to instill in his students the life-long mindset that not every moment is "entertaining, engaging or 'on'."

Lynn, like Ellen, Polly, and Ledarrius stated time as her biggest challenge as she incorporates technology into her teaching. "I do not have a lot of time to 'play' and learn new things, even though I want to. I want to be on top of the latest technology and what the kids find engaging", but there is never enough time. Following time was the obstacle of access, which both Lauren and Polly found to be challenging as well. One example of this challenge of access is how during state mandated testing, all available technology would be in use for testing purposes and testing happens several times a year. While access to actual technology was a challenge for Polly, the infrastructure in the smaller county was a source of access challenge as well. She found that even when she followed protocol to sign up for the computer lab or mobile carts, the wifi was often out or intended websites were blocked or the time it took to get everything set up was prohibitive.

The Digital Native students themselves were a challenge Lynn faced, along with Ellen, Polly, and Ledarrius. She echoed the other participants' sentiments when she stated, "Students today…they want to be entertained. They want things to be constantly moving and shifting, like we are a video game." With limited technology access,

combined with Lynn's subject of math, it often has to be taught using more traditional teaching practices and the students find it "boring." When speaking of her students, Lynn once again experienced what the other participants, with the exception of Lauren, experienced:

> …the kids are well versed in technology for entertainment, but ask them to use higher order thinking or solve a technology issue and they are lost. They want to use technology for 'fun' sake, for entertainment and games, but aren't capable of moving past that…and makes me feel like I'm the one at an advantage sometimes-the old lady who can overcome obstacles with technology

Lynn also brought up Digital Natives' shortened attention spans as part of this issue. She often felt she was in a competition with the student's phones and had to work hard to be more engaging than their phone's offerings. She compared this to a time when she had to keep students' attention away from their friends, but the shift now is all to the device at their disposal.

Laura, like Ellen, was well versed in technology from her previous careers when she entered the arena of education. The biggest challenge Laura faced when implementing technology was one also experienced by all the other participants, with the exception of Lauren, and it was that of her Digital Native students and how they viewed technology. "They have a hard time separating that technology isn't just 'fun' with technology that is used to learn. It's a constant balancing act that goes along with that 'entertain me' mindset."

Laura has also seen a shift in students from when she started teaching 16 years ago, with today's students having a shorter attention span. She has had to explain to her

students that “it is not always possible to be on a device or use technology”. In dealing with students who want to be entertained, with short attention spans, Laura believed communication with her students to be critical to keeping their attention. “I think communicating with them… helps keep their attention because they don’t get that in a lot of other places.”

Across all participants a challenge faced was that of keeping up with the rapid and ever-changing pace of technology. Ellen, Ledarrius, and Lynn all cited word of mouth and colleagues as their first source of support for overcoming this challenge. Ledarrius joking referred to this strategy when he said, “being a thief is the only way to keep up with technology! By that I mean, I definitely learn with others that teach what I teach and collaborate with teachers from the next level of education.” Lauren, Lynn, and Laura all said not just their colleagues, but their own personal childrenn helped them keep current in the world of technology, which is interesting, consider the vast age differences of their children. Lauren and Lynn have middle school aged children and Laura has children out of college in their 20’s. Ledarrius also uses his Digital Native students as a source to keep current with technology. Polly, who does not have any children, stated she makes sure to attend as many technology- based trainings as possible to stay current. Table 3 presents each participants’ beginning LoTi framework level and their current LoTi framework level. As indicated in the findings, not all levels were static.

Table 3

Participants' LoTi Framework Levels

Participant	Beginning LoTi Framework Level	Current LoTi Framework Level
Ellen	2	4-6
Lauren	2	4
Polly	0	4-5
Ledarrius	0	5
Lynn	0	3
Laura	2-3	4-5

Summary

This chapter presented the findings of the study, the themes discovered through the data. The lived experiences of Digital Immigrant teachers were examined as they implemented technology into their teaching. Data were collected through three separate in-depth interviews with each participant, where the participant was asked open ended questions by the researcher. One classroom observation of each participant occurred, as well as lesson plan review. Themes were identified and supported through the data. Data were analyzed through open, axial, and selective coding. 20 codes were initially used when open coding took place. This number was then reduced to 17 during axial coding and further reduced to 11 codes during the final, selective coding process .As seen in Table 2, the codes established were the overarching themes discovered in the data and included: Challenges (249), Self as Digital Immigrant (204), Impetus for Use (184), Use (173), Digital Native Students (165), Impact of Use (137), Staying Current (102), Support

(90), Catalyst for Change (84), Digital Native Colleagues (59), and Digital Immigrant Colleagues (42). The codes discovered from the data were then analyzed through the lens of each research questions that guided the study and each research question was addressed by participant. The challenge most common to all participants was that of their digital native students. This challenge presented itself the digital natives' expectation of technology use, their attitude technology as entertainment, as well as their ability to use technology for "fun" purposes, but lacking in educational technology skills. Time and access were also challenges participants had to overcome in order to successfully integrate technology into their teaching.

While three participants, Ellen, Lauren, and Laura, began their teaching careers with positive attitudes toward technology, which have only strengthened with the passing of time, the remaining three participants, Polly, Ledarrius, and Lynn, showed dramatic changes in their attitude toward technology use in their teaching. These participants now view technology as an essential tool to their teaching and could not imagine teaching without it. Again, mirroring research question one, the same phenomenon was observed when examining research question two and the participants' use of technology. While all participants expanded their use of technology from the beginning of their teaching careers, it was again Polly, Ledarrius, and Lynn who experienced the most dramatic evolution in their technology use. Despite the participants teaching in varied school settings, with inequitable access to technology, it was found the prevailing challenges were common to them all. Digital native students themselves emerged as the largest challenge faced by participants, followed by the challenge of time. Both of these

challenges are extrinsic to the teachers themselves and impact their teaching with technology on a daily basis.

In the following chapter, the data presented will be further analyzed in order to present findings, implications, and recommendations for future research.

Chapter V

CONCLUSIONS

Discussion

The use of technology in education is ubiquitous. The benefits of technology implementation are immense. In a meta-analysis conducted by Lai and Bower (2020), 65 of the 73 articles analyzed concluded technology use led to learning benefits and improvements, leading Lai and Bower (2020) to emphasize the importance of the use of technology in education. Among the benefits listed by Lai and Bower (2020) were improvements in problem solving, interpersonal capabilities, and knowledge. Affective benefits were also found in 31 of the 33 articles which examined affective elements of technology use. These affective elements included motivation, satisfaction, and enjoyment. Learning behaviors, such as social negotiations and interactions, were also cited to improve with technology use.

Chauhan (2017) asserted when technology was an integral part of pedagogy, it was a dynamic tool for effective learning in elementary students. Chauhan (2017) also stated that many school districts across the county are committing a substantial amount of their annual budgets to stay abreast of current technologies, with the intention of improving student academic performance. This was found to be the case with both of the school systems in the study.

Autry and Berge (2011) cite the many differences between Digital Immigrants and Digital Natives, from their personalities to learning styles. Yet, despite these differences, Digital Immigrant teaches must work with and teach Digital Native students and need to do so effectively. Autry and Berge (2011) asserted the necessity for a new digital pedagogy. Within this pedagogy, there should be an emphasis on providing Digital Native students with a wide range of technology tools, which would then allow them to construct their own knowledge and understanding (Autry & Berge, 2011). This approach would fall into the levels five and six on the LoTi framework. However, this can be a challenge for Digital Immigrant teachers and it is one that some Digital Immigrant teachers have resisted, while others have jumped in feet first to meet the challenge.

This study sought to discover the lived experiences of Digital Immigrant teachers and their implementation of technology into their teaching of Digital Native students. Six teachers, in two different public-school systems, participated in this phenomenological study. The research questions used to guide this study were:

1. How have digital immigrant teachers' attitudes towards technology in the classroom changed over the course of their teaching?
2. How have digital immigrant teachers use of technology changed over the course of their teaching career?
3. What are the challenges digital immigrant teachers face as they implement technology into their teaching?

The teachers in the study participated in three in-depth interviews, at the time and location of their choosing. Siedman's (2006) protocol was followed for the interviews.

The first interview was designed to delve into the life history of the participant as it relates to technology. The second interview was designed to explore the participant's current teaching practices with technology. The third interview was designed for the participant to reflect on the meaning of their lived experiences with technology in their lives and teaching.

An in-depth overview of each participant is included in the previous chapter; however, I will give a brief review of each participant and their teaching roles. The participants were divided evenly between the two public school systems in the study. Ellen, Lauren, and Polly all worked in the same elementary school in the larger school system. Ellen is a Caucasian woman, 60 years of age. She has 15 years of teaching experience and has been a Media Specialist and Technology Specialist. Lauren is a Caucasian woman, 44 years of age. She has been teaching kindergarten for the majority of her 20 years of teaching. Polly, the third teacher from the larger school system in the study, is a 41-year-old African American woman. She has taught fourth grade for 17 years. Ledarrius, the only male participant is a 43-year-old African American is a teacher in the smaller school system in the study. He has taught Engineering in high school for 18 years. Lynn is a 58-year-old Caucasian woman who currently teaches middle school math. She has taught math in both high school and middle school for 19 years. Laura is a 58-year-old African American woman who has taught Special Education in middle school for 16 years.

Interview transcripts, field notes, classroom observation reflections, and lesson plans allowed for rich data collection. Recurring themes were discovered regarding Digital Immigrant teachers and their lived experiences of integrating technology into

their teaching of Digital Native students. Close examination of the participants' practices associate with their technology use could allow others to benefit from this study.

Interpretations of the Findings

The findings of this study were based on responses from six Digital Immigrant teacher participants who taught public school at the elementary, middle, and high school level.

Digital Immigrants' Attitudes Toward Technology

Research question 1: How have digital immigrant teachers' attitudes towards technology in the classroom changed over the course of their teaching?

The results of the study revealed Digital Immigrant teachers' attitudes toward technology use in their teaching. In order to address research question one regarding Digital Immigrant teachers' attitude change toward technology in the classroom, data were analyzed and coded. These codes were then looked at across all participants.

Two of the six participants, Ellen and Laura, had extensive exposure and experience with technology in previous careers before joining the teaching profession and their attitudes did not show a significant shift. These two participants already recognized the importance of technology in their previous careers and brought this attitude into the classroom as well. One of the six teachers, Lauren, began her teaching career with 10 Apple desktops in her room and started teaching with a health attitude toward technology use. Three of the six teachers in the study, Polly, Ledarrius, and Lynn, had a shift in attitude toward technology in the classroom over the course of their teaching. These three teachers did not have the beginning attitude that technology was an important component in the classroom. When reflecting on his beginning attitude, Ledarrius

remarked, “It wasn’t really about the students, it was about me and making my life easier.” This was a sentiment echoed by several of the participants when reflecting on their beginning attitude. Lynn stated, “I wasn’t very comfortable with technology, so I wasn’t the kind of person who was going to seek it out.”

When looking at participants’ current attitudes toward technology, Ledarrius may have experienced the biggest shift in attitude, when he said, “Technology is a vital tool to my teaching and I don’t ever envision teaching without it as a cornerstone of my instruction.” Lynn, who not at all comfortable with technology at the beginning of her career, had this to say:

> Technology has become an integrated portion of my teaching…it’s so weird to reflect back on where I started with technology with your first few questions, and where I am now. It was so foreign to me then, but now? I can’t imagine teaching without it.

When reflecting on her current use and how she sees herself using it in the future, Polly had this to say, “I find it to be a non-negotiable and an absolute requirement. It’s so interwoven, that I can’t imagine teaching without it now.” The prevailing attitude of all participants was that of being open to learning new things and being honest with their students about their abilities and there always being something new to learn.

Digital Immigrants’ Change in Technology Use

Research question 2: How have digital immigrant teachers use of technology changed over the course of their teaching career?

The results of the study revealed Digital Immigrant teachers’ change in technology use throughout their career. In order to address research question two

regarding Digital Immigrant teachers' change in technology use in the classroom, data were analyzed and coded. These codes were then looked at across all participants.

As with research question one, Ellen and Laura experienced the least drastic change in technology use. All participants advanced on the LoTi framework from beginning use to current use of technology. Both Ellen and Laura were only limited at the beginning of their careers by the limited availability of technology in their schools and bolstered at the same time by support and training. The most drastic change in technology use occurred with Polly, Ledarrius, and Lynn. Ledarrius went from only using technology to make his teaching life easier to flight simulators and 3D printers. Polly grew from the Wii as a reward system to using programs like Voice Thread, which allows students to complete problems digitally and explain their thinking as the work. Polly saw great success with her students taking what they learned in Wixie in Language Arts and translating it to Social Studies for historical character interviews. When remarking on one of the biggest effects of her increased technology use, Polly remarked, "It allows us to open up our students' worlds and really prepare them to be life-long learners."

Challenges Faced by Digital Immigrant Teachers

Research question 3: What are the challenges Digital Immigrant teachers face as they implement technology into their teaching?

The results of the study revealed the challenges Digital Immigrant face as they implement technology into their teaching. In order to address research question three regarding Digital Immigrant teachers' challenges, data were analyzed and coded. These codes were then looked at across all participants.

Challenges was the code with the highest groundedness at 249. Groundedness refers to how often a particular code occurred. There was one particular challenge present across all six participants. This was the challenge of time. Time was a multi-pronged challenge in that it was not only a challenge in the aspect of participants having the time to implement technology, but also as a roadblock to participants in learning and staying current in the latest advances in technology. Even Ellen, whose Technology Specialist job allowed her a more flexible schedule, found time to be a challenge. Lauren, when addressing the challenge of time in her kindergarten classroom said, "A big obstacle I face is managing time and juggling schedules…" This can range from signing up for a computer lab or managing shared iPads with other teachers. Lynn's experiences, in present day 2019, echoed what Tsai and Chai found in 2012, "teachers are still not using them [technology] because of the clash of timetabling and tedious booking procedures". Lynn shared her frustration of wanting to sign up for the computer lab, but the time she needed is not available or signing up for the computer lab, only to get there and find the wifi is out and the lab cannot be used, which then cuts into the time she has to get back to her room with the class and work an alternative plan. Even when she can use the computer lab,

> Let's say I do get signed up. Then it takes *time* to get the whole class there-there are always stragglers-, then it takes *time* to get everything set up, On top of that, if I am only using it in one class period, then I have to figure out the *time* to get it all back before my next class period. *Time*. *Time* is the enemy most days.

A sentiment all the participants echoed across the board. Of time, Polly said, "There is just never enough of it."

Access, which was touched on when discussing the challenge of time, was also one of the challenges many of the participants encountered when integrating technology into their teaching. The teachers in the larger system did not have as much of an issue with access to technology as those in the smaller school system, but it was still present, more so for Lauren in kindergarten than Polly in fourth grade. The smaller school system teachers seemed to have a bigger issue with access to technology. Lynn, as the only participant who worked in both systems, was able to compare her access in high school in the larger system to middle school in the smaller system and found the smaller system lacking.

A perhaps unexpected challenge five out of the six participants mentioned was the Digital Native students themselves. Shorter attention spans, as compared to their peers 10 years ago was a big topic of participants challenges. In addition, many of the learning styles Digital Natives have been known to exhibit (rapid pace of work and play, multi-tasking (Autry & Berge, 2011) were listed as challenges by all participants, with the exception of Lauren. This is something Ellen noticed with all of her students, from elementary age to the university level, as well as with some Digital Native teachers. "They want the game aspect, but not necessarily the usefulness aspect." Ledarrius had this to say about the change he has seen in his students over the past decade, "… they want to use technology for entertainment sake and not learning. That can be frustrating to have students who constantly want to be entertained or gamified. It's a challenge to engage them with short little attention spans."

Implications

The purpose of this study was to investigate the lived experiences of Digital Immigrant teachers as they implement technology into their teaching. Findings suggest Digital Immigrant teachers have changed their initial attitudes about technology and now find it an integral component to teaching Digital Native students. This study contributes to the current body of literature available on the topic of Digital Immigrant teachers and Digital Native students. The existing literature on the subject is out of date and limited.

As teachers continue to be critical stakeholders in the successful integration of technology in our schools, research is needed to understand how Digital Immigrant teachers have successfully bridged the gap to meaningful technology use. Findings from this study may provide a starting point for school systems for professional development geared specifically toward Digital Immigrant teachers or those teachers resistant to technology use, regardless of age. This study delves into Digital Immigrant teachers' attitudes, motivations, and how they have overcome Ertmer's (1999) first order barriers in order to integrate technology successfully into their teaching. As Tsai and Chai (2012) stated, "barriers will always exist in one form or another…Building teachers'/educators' design capacity is therefore arguably the most critical task" (p. 1059). By understanding Digital Immigrants teachers' attitudes, challenges, perceptions, and use of technology and how they can be supported, necessary insight can be provided to support reluctant users. By providing professional development specifically geared to reluctant users, school leaders can support these teachers to promote more meaningful technology integration.

In addition, school systems and local administrators can examine the challenges faced by Digital Immigrant teachers and make strides in reducing the challenge of access

by allocating technology resources where needed. When planning and making local school decisions, principals can examine the difference in technology access between grade levels and county personnel can look at the inequity between elementary, middle, and high schools. Many of the participants in the study had impactful experience with colleagues, which impacted their own technology use. School systems and local administrators should consider providing more time for teachers to collaborate and support one another in technology use, as well as exposing teaches to more opportunities to use technology.

Recommendations for Future Research

Technology, as ever present and ever changing, can continue to act as a roadblock to teacher use. Teachers must be able to use and interact with technology in a meaningful manner in order to educate Digital Native students and prepare them for their future. Future research focused on Digital Immigrant teachers teaching Digital Native students may wish to focus on the areas listed here:

1. All the participants from the larger school system were from one elementary school and future studies which included a wider range of levels in a system would be advantageous to fully capture Digital Immigrants teachers' lived experiences with technology. Five of the six participants were females and future studies may include a more balanced ratio of female to male participants.
2. The size of the school systems were different, but still rather large. Future studies could include smaller school systems. The geographic area was limited and future studies could expand to include more geographic areas. Both systems were in densely populated areas, but still suburban. Future studies could include

increased variety in geographic areas (rural and inner-city school systems).

3. Research question three brought several common challenges to light. Future studies could focus on one challenge and investigate how other Digital Immigrant teachers have overcome these obstacles associate with one specific challenge.
4. The participants in the study emphasized the impact of colleague's use of technology on their own technology use. Future studies could explore the impact of increase collaborative time among teachers on technology use.
5. While this was a qualitative study, quantitative studies would add to the notion of Digital Immigrant teachers teaching Digital Native students.

Summary and Conclusion

As the technology continues to be a more and more pervasive part of everyday life and more students come to school having lived a life of constant immersion and connectivity, Digital Immigrant teachers must adjust to accommodate the need and learning styles of Digital Native students. There is a plethora of research that indicates meaningful technology use can result in increased student achievement (Chan & Leung, 2014, Chauhan, 2017, Cherry, 2014), but if Digital Immigrant teachers are not comfortable using technology, it will be impossible to meet Digital Natives' students learning needs. Educators themselves must be viewed as the agent of change and not the technology that is being used in their classrooms and schools (Fischer, 2006). As Hicks (2011) reports there are many teachers who are still resistant to technology and its ubiquitous use in classroom, despite technology being the new normal and no longer a luxury. With the manner in which technology continues to grow and rapidly advance, comes constant change and learning, particularly for educators. Schools and teachers

must constantly be aware of trending technology and how to best use if for meaningful technology use. The Digital Immigrant teachers in this study have not only adapted to technology's rapid pace and change, but have embraced technology and its use in order to improve their teaching and their students' learning. These results support Ertmer's (2005) theory of social/cultural influences to promote teachers' technology use. However, the cultural influence was coming mainly with students as the impetus, and not necessarily colleagues. With this in mind, the purpose of this phenomenological study was to examine the lived experiences of Digital Immigrant teachers who have successfully integrated technology into their teaching. By gaining insight into the attitudes, teaching practices and challenges Digital Immigrant teachers face, school systems can move forward to assist other Digital Immigrant teachers in successfully integrating technology into their teaching.

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Appendix A

VSU Qualtrics Survey Questions

Appendix A

Digital Immigrant Teachers and Their Implementation of Technology

Survey Questionnaire

Were you born:

-Before 1980

-After 1980

What grade level do you currently teach?

-Elementary: Primary

-Elementary: Intermediate

-Middle School

-High School

Is technology used in your teaching?

-Yes

-No

Is there evidence of technology use related to higher-order thinking by students?

-Yes

-No

Is technology used by students for lower-order cognitive skills?

-Yes

-No

Is technology used by the teacher for productivity tools (i.e. lecture, direct instruction, teacher created multi-media presentations, with limited student interactions)?

-Yes

-No

Is the learning experience student-centered, with teacher-directed tasks?

-Yes

-No

Is there two-way collaboration with experts outside the classroom?

-Yes

-No

If "no" was answered:

-This is due to unresolved classroom management or school climate issues.

-This is due to a heavy reliance on prepackaged materials and/or outside resources.

-Students remain fully engaged in self-directed, problem based, real world learning activities.

-None of the above

Do students occasionally use digital resources extending beyond the classroom for authentic problem solving and issues resolution?

-Yes

-No

Do students consistently use digital resources extending beyond the classroom for authentic problem solving and issues resolution?

-Yes

-No

Would you be willing to be contacted by the researcher?

-Yes

-No

The email where the researcher may contact you?

Appendix B

Consent to Participate in Research

Appendix B

VALDOSTA STATE UNIVERSITY

Consent to Participate in Research

You are being asked to participate in a research project entitled "Digital Immigrant Teachers and Their Implementation of Technology". This research project is being conducted Nicole Warren Birch, a student in Dewar College, Curriculum and Instruction at Valdosta State University. The researcher has explained to you in detail the purpose of the project, the procedures to be used, and the potential benefits and possible risks of participation. You may ask the researcher any questions you have to help you understand this project and your possible participation in it. A basic explanation of the research is given below. Please read this carefully and discuss with the researcher any questions you may have. The University asks that you give your signed agreement if you wish to participate in this research project.

Purpose of the Research: This study involves research. The purpose of the study is to discover influences, factors, or beliefs that may have shaped digital immigrant teachers to integrate technology into their teaching.

Procedures: Participants will be asked to fill out a LoTi "Sniff" Test regarding their implementation of technology in their teaching. Participants will be asked to take part in a series of three interviews and one classroom observation. There are no alternatives to the experimental procedures in this study. The only alternative is to choose not to participate at all.

Particpants will be asked to choose a convenient time and location for interviews. Interviews will be approximately 90 minutes. During interviews, you will be asked about your past experiences teaching with technology, your present day experiences teaching with technology, and your thoughts on your future use of technology in your teaching. Interviews should be spaced anywhere for 3 days to a week apart, with a classroom observation taking place between interview number two and three. Observations will be approximately 60 minutes.

Possible Risks or Discomfort: Although there are no known risks associated with these research procedures, it is not always possible to identify all potential risks of participating in a research study. However, the University has taken reasonable safeguards to minimize potential but unknown risks.

By agreeing to participate in this research project, you are not waiving any rights that you may have against Valdosta State University for injury resulting from negligence of the University or its researchers.

Potential Benefits: Although you [may/will] not benefit directly from this research, your participation will help the researcher gain additional understanding of influences or factors that may facilitate digital immigrant teachers' use of technology in their teaching.

Costs and Compensation: There are no costs to you and there is no compensation (no money, gifts, or services) for your participation in this research project.

Assurance of Confidentiality: Valdosta State University and the researcher will keep your information confidential to the extent allowed by law. Members of the Institutional Review Board (IRB), a university committee charged with reviewing research to ensure the rights and welfare of research participants, may be given access to your confidential information.

All study data, including interview transcripts, audio recordings of interviews, field notes, observation guides, observation reflections, and coding information will be secured in the researcher's home office, in a locked safe. Only the researcher will have access to this information. This information will be kept for three years. All documentation will be destroyed through a reputable document destruction company.

Particpants will remain anonymous through the reporting of the data and will not be associated by name or any other identifiable information. Individual participant data will be reported in combination with information from other study participants.

Voluntary Participation: Your decision to participate in this research project is entirely voluntary. If you agree now to participate and change your mind later, you are

free to leave the study. Your decision not to participate at all or to stop participating at any time in the future will not have any effect on any rights you have or any services you are otherwise entitled to from Valdosta State University.

You may skip any questions that you do not want to answer.

Should you decide to withdraw from the study after the data collection is complete, your information will be deleted from the study and will not be included in the study results.

Information Contacts: Questions regarding the purpose or procedures of the research should be directed to Nicole Birch at (404)861-8355 or nwbirch@valdosta.edu This study has been approved by the Valdosta State University Institutional Review Board (IRB) for the Protection of Human Research Participants. The IRB, a university committee established by Federal law, is responsible for protecting the rights and welfare of research participants. If you have concerns or questions about your rights as a research participant, you may contact the IRB Administrator at 229-333-7837 or irb@valdosta.edu.

Agreement to Participate: The research project and my role in it have been explained to me, and my questions have been answered to my satisfaction. I agree to participate in this study. By signing this form, I am indicating that I am 18 years of age or older. I have received a copy of this consent form.

I would like to receive a copy of the results of this study:

_____ *Yes* _____ *No*

Mailing Address:

_____

e-mail Address: _____

_____

Printed Name of Participant

This research project has been approved by the Valdosta State University Institutional Review Board for the Protection of Human Research Participants through the date noted below:

_____

Signature of Participant Dat

_____

Signature of Person Obtaining Consent Dat

Appendix C

Interview #1 Guiding Questions

Appendix C

Interview #1 Questions

Interview #1
Participant: _____ Length: _____
Date: _____
Location: _____

(This interview is designed to put the participants' experiences with technology in context)

1. Tell me about your early experiences with technology.

2. How did you come to decide technology was a valuable resource to use in your teaching/with your students?

3. How did you come to adopt new/unfamiliar technology in your teaching?

4. Tell me about how incorporating technology into your teaching practice has affected your teaching.

5. What was it like having to learn new technology as it was introduced and your students were already familiar with it?

6. How have you decided which technology to use/not use?

7. What have you found works to help you keep up with the changing pace of technology?

8. Tell me about any technology you have tried to learn, but you did not experience success.

Appendix D

Interview #2 Guiding Questions

Appendix D

Interview #2 Questions

Interview #2

Participant: _____ Length: _____

Date: _____

Location: _____

(This interview is designed to put the participants' lived experience into concrete details)

1. Let's review your LoTi "Sniff" Test. How does this fit into your every day teaching?

2. Tell me as much as possible/describe or reconstruct a day of teaching, from when you arrive at school, to when you finish for the day (which may or may not be when you leave school for the day).

3. Tell me about your biggest daily obstacles or challenges with using technology in your teaching. How do you overcome these?

4. Tell me about your biggest successes when using technology in your teaching.

5. "What is it like to integrate technology into your teaching as a digital immigrant?"

Appendix E

Interview #3 Guiding Questions

Appendix E

Interview #3 Questions

Interview #3

Participant: _____ Length: _____

Date: _____

Location: _____

(This interview is designed to have the participant reflect on the meaning of teaching with technology)

1. What is it like for you to teach students who are constantly immersed in technology?

2. What is it like to teach with colleagues who have spent their lives immersed in technology?

3. Given what you have said about your early experiences with technology and your daily teaching with it now, how do you understand your use of technology and its role in your teaching?

4. Given what you have said about your past experiences, challenges, successes, with technology and how you use technology today, how do you see yourself using technology in the future?

5. "What does it mean to be a digital immigrant who uses technology in your teaching?"

Appendix F

Interview Reflection Sheet

Appendix F

Interview Reflection

Interview Reflection

Participant:

Date of interview:

Brief description of setting:

General impressions from interview:

What went well during the interview:

What was difficult/challenging during the interview:

Questions/direction for next interview?

Follow Up?

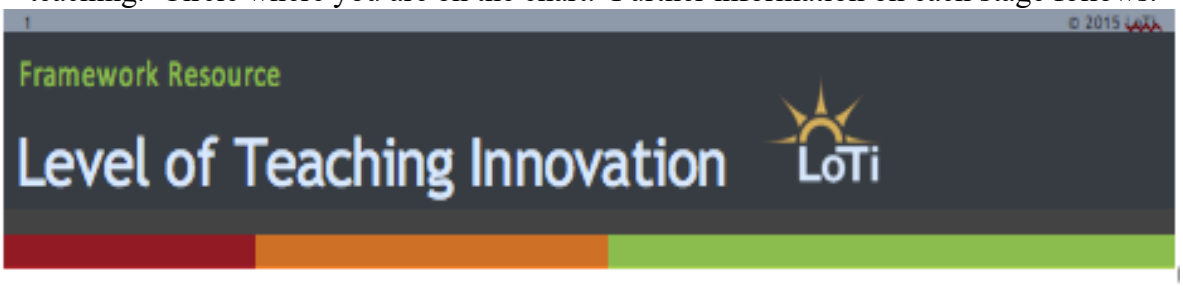
Appendix G

LoTi “Sniff” Test

Appendix G

LoTi "Sniff" Test

Please look at the following "Sniff" Test and rank your use of technology in your teaching. Circle where you are on the chart. Further information on each stage follows.



Level of Teaching Innovation (LoTi) Framework

LoTi 0: Non-use
At a Level 0 (Non-Use), the instructional setting—including the use of digital and/or environmental resources—does not support or promote purposeful learning aligned to academic standards/expectations.

LoTi 1: Awareness
At a Level 1 (Awareness), the instructional focus is exclusively direct instruction. Student learning focuses on lower levels of cognitive processing (e.g., Bloom Levels - remembering, understanding, applying; Webb's Levels – recall & reproduction, working with skills & concepts). Digital and/or environmental resources are either (1) non-existent or (2) used by the classroom teacher to enhance teacher presentations.

LoTi 2: Exploration
At a Level 2 (Exploration) the instructional focus emphasizes content understanding and supports mastery learning and direct instruction. Student learning focuses on lower levels of cognitive processing (e.g., Bloom Levels - remembering, understanding, applying; Webb's Levels – recall & reproduction, working with skills & concepts). Digital and/or environmental resources are used by students for extension activities, enrichment exercises, information gathering assignments, or presentations that reinforce lower cognitive skill development relating to the content under investigation.

LoTi 3: Infusion
At a Level 3 (Infusion), the instructional focus emphasizes student higher order thinking (e.g., Bloom Levels – analyzing, evaluating, creating; Webb's Levels – short-term strategic thinking) and teacher-directed problems. Though specific learning activities may lack authenticity, the instructional emphasis is, nonetheless, placed on higher levels of cognitive processing and in-depth treatment of the content using a variety of thinking skill strategies (e.g., problem-solving, decision-making). The concept attainment, inductive thinking, and scientific inquiry models of teaching are the norm and guide the types of products generated by students.

Digital and/or environmental resources are used by students and/or the teacher to execute teacher-directed tasks that emphasize higher levels of student cognitive processing relating to the content standards.

LoTi 4a: Integration (Mechanical)
At a Level 4a (Integration: Mechanical) students are engaged in exploring real-world issues and solving authentic problems using the available digital and/or environmental resources; however, the teacher may experience classroom management (e.g., disciplinary problems) or school climate issues (lack of support from colleagues) that restrict full-scale integration. Heavy reliance is placed on prepackaged materials and/or outside resources (e.g., assistance from a peer coach) that aid the teacher in sustaining student-directed learning. Emphasis is placed on the constructivist, problem-based models of teaching that require higher levels of student cognitive processing (e.g., Bloom Levels – analyzing, evaluating, creating; Webb's Levels – short-term strategic thinking, extended strategic thinking) and in-depth examination of the content standards.

Student use of digital and/or environmental resources is inherent and motivated by the drive to answer student-generated questions that dictate the content, process, and/or products embedded in the learning experience.

LoTi 4b: Integration (Routine)

At a Level 4b (Integration: Routine) students are fully engaged in exploring real-world issues and solving authentic problems using the available digital and/or environmental resources. The teacher is within his/her comfort level with promoting an inquiry-based model of teaching that involves students applying their learning to the real world (e.g., Webb's Levels – extended strategic thinking). Emphasis is placed on learner-centered strategies and the constructivist, problem-based models of teaching that promote personal goal setting and self-monitoring, student action, and issues resolution.

Students use of digital and/or environmental resources is inherent and motivated by the drive to answer student- generated questions that dictate the content, process, and products embedded in the learning experience.

LoTi 5: Expansion

At a Level 5 (Expansion), student collaborations extending beyond the classroom are employed for authentic problem-solving and issues resolution. Emphasis is placed on learner-centered strategies that promote personal goal setting and self-monitoring, student action, and collaborations with other groups (e.g., another school, different cultures, business establishments, governmental agencies).

Student use of digital and/or environmental resources is inherent and motivated by the drive to answer student- generated questions that dictate the content, process, and products embedded in the learning experience.

The complexity and sophistication of the digital and environmental resources and collaboration tools used are commensurate with (1) the inventiveness and spontaneity of the teacher's experiential-based approach to teaching and learning and (2) the students' level of complex thinking (e.g., problem-solving, decision-making, experimental inquiry) and in-depth understanding of the content standards.

LoTi 6: Refinement

At a Level 6 (Refinement), student collaborations extending beyond the classroom that promote authentic student problem-solving and issues resolution are the norm. The instructional curriculum is entirely learner- based involving the content, process, and product of instruction. The content emerges based on the needs of the learner according to his/her interests and/or aspirations and is supported by ubiquitous access to the most current digital tools and resources.

The pervasive use of and access to advanced digital tools and resources provides a seamless medium for information queries, creative problem-solving, student reflection, and/or product development. Students have ready access to and a complete understanding of a vast array of online collaboration tools and related digital resources to accomplish learning outcomes beyond conventional strategies.

Appendix H

Valdosta State University IRB

Valdosta State University IRB

Appendix I

Interview Reflection Sheet

Appendix I

Interview Reflection

Interview Reflection

Participant:

Date of interview:

Brief description of setting:

General impressions from interview:

What went well during the interview:

What was difficult/challenging during the interview:

Questions/direction for next interview?

Follow Up?

Appendix J

Observation Guide

Appendix J

Observation Guide

Descriptive Notes	Reflective Notes