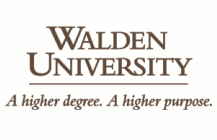

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Perceptions Among K-12 School Leaders and Classroom Educators of One-to-One Computing

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This is to certify that the doctoral dissertation by

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has been found to be complete and satisfactory in all respects,
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Abstract

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by

Sandra Wenzel

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Educational Technology

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Abstract

The rate of adoption of 1-to-1 computing in U.S. K-12 schools does not meet the requirements of educational standards, and it is unclear why the requirements for use of digital technology inside schools have still not been met. The purpose of this qualitative case study was to analyze the thoughts of school leaders, classroom educators, and technicians about the integration of 1-to-1 computing using Rogers's diffusion of innovations theory as the framework. The research questions probed leader, teacher and technician views of integrating 1-to-1 technology. Participants consisted of 1 school leader, 1 technician, and 3 classroom educators from a Georgia school who consented to be interviewed. Data were collected through a series of audio-recorded interviews. Analysis consisted of open and axial coding of the transcripts of interviews, resulting in themes addressing the research questions and supporting the framework. Results included participants indicating that 1-to-1 technology has to be useful, observable, and "try-able." They responded that teacher input should be used in adoption of new technology, and technology should come in a variety of forms, a 1-size-fits-all approach will not be successful. Classroom educators indicated they used peers, trying and observing a technology, and research as information sources when considering a new technology. Funding emerged as the largest barrier in adoption of 1-to-1 computing. Reported benefits included high student motivation, ability to self-pace course work, online assessments, and preparation of students for future education and employment. Positive social change may occur when decision makers use these findings to develop effective integration of one-to-one computing to positively influence instruction and learning.

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Chapter 1: Introduction to the Study

My purpose in this qualitative case study was to analyze the perceptions among one school leader, three classroom educators, and one technician regarding the integration of one-to-one computing (the ratio of computers to students and teachers) in one school district when viewed through the lens of Rogers's diffusion of innovations process. According to Rogers (2003), "Diffusion is the process by which an innovation is communicated through certain channels over time among members of a social system" (p. 11). The literature review revealed a gap in research on the views among school leaders and classroom educators regarding the integration of technology in schools.

I studied school leaders' and classroom educators' views on implementing one-to-one computing in one school district in central Georgia. Anthony (2012) noted that, despite more than 30 years of policies promoting the integration of technology in classroom instruction, far less than 50% of U.S. teachers are regularly integrating technology into teaching. Many K-12 teachers in the United States have not altered their instructional practice for years, thereby maintaining a relatively constant directed approach and not integrating technology despite recommendations to integrate educational technology into instruction (Means, 2010). As demonstrated in the literature review, problems exist in U.S. K-12 schools regarding the integration of one-to-one computing.

Many constructive results are possible from implementing one-to-one computing in K-12 U.S. schools. According to Johnson, Smith, Willis, and Haywood (2009), the positive outcomes of one-to-one computing relate directly to school visions for learners.

The optimal situation for technology integration into the classroom would consist of every student and teacher having access to a computer and a well-managed high-speed network with Internet access (Johnson et al., 2009). One-to-one computing provides students with rapid access to information and research-based resources. In addition, one-to-one computing can increase students' opportunities to collaborate, create, and contribute to problem solving using shared software applications. Successful one-to-one initiatives are a result of students having access to hardware and a strong technological infrastructure, long-term financial commitment, and rigorous ongoing professional development for teachers (Johnson et al., 2009). Access, long-range plans, and professional development are significant factors to make the integration of one-to-one computing successful.

Researchers such as Duggan, Schwartzbeck, and Wolf (2012); Jackson, Gaudet, McDaniel, and Brammer (2009); Johnson et al. (2009); and Lesiko, Wright, and O'Hern (2010) contended that technology and digital learning provide the critical educational support that U.S. students need for improved academic performance and global competitiveness. Students in the United States are struggling to keep up with students in other countries (Duggan et al., 2012). Anthony (2012) noted that, despite more than 30 years of policies promoting the integration of technology in classroom instruction, only 35% of U.S. teachers are regularly integrating technology in their teaching.

This chapter includes an overview of current literature and gaps in knowledge in the area of diffusion of one-to-one computing for K-12 U.S. students. I also explain my choice for the theory used to frame the study. Despite federal legislation, national and

international policies, standards, and technology plans, making access to technology for one-to-one computing significant in K-12 classrooms has yet to happen in the United States (Lesiko et al., 2010; Ward & Parr, 2011).

Chapter 1 also includes background information on the integration of educational technology. The problem statement relates to the lack of one-to-one computing in K-12 schools in the United States. Also presented is the justification for examining the diffusion process regarding the integration of one-to-one computing in K-12 schools from school leaders' and classroom educators' viewpoints. The topic that I have explored through research questions is how school leaders and classroom educators view the process of integrating one-to-one technology based on Rogers's (2003) five phases of the diffusion process and recommendations to school district leadership on the diffusion of one-to-one computing. In addition, I discuss the conceptual framework of Rogers's diffusion of innovation theory as it relates to framing this study. Finally, I conclude Chapter 1 with a description of the qualitative approach to the study, definitions of terms, assumptions, scope and delimitations, limitations, and significance of the study.

Background

The literature reviewed includes key aspects that indicate a need for the study and the study's significance. In addition, the background includes a summary of issues related to the problem of a lack of one-to-one computing in K-12 U.S. schools. A gap existed in the literature related to school leaders' and classroom educators' views and experiences on one-to-one computing integration. Despite the rapid rise in educational technology integration policies and educational technology standards, there remains a lack of

technology integration in schools, according to Jackson et al. (2009). A detailed discussion of rapid technology changes and of the lack of technology integration in schools appears in Chapter 2.

Ham and Cha (2009) reported on the rapid pace of technology development and on how information and communication technology (ICT) has changed global society and education. Ham and Cha reported that leaders of global agencies began providing reasons why schools should use technology to enhance learning in the mid-1970s. Ham and Cha also discussed the 2000 charter by the Group of Eight heads of state. The charter included a recommendation that schoolchildren have more access to technology to develop ICT literacy. Internationally, school leaders have developed ICT curriculum policies and noted that a global society connected with ICT influences the curricula of individual countries.

Ward and Parr (2011) also noted the increase in ICT educational policies, but the authors cautioned that, despite these policies, insufficient evidence indicates how these policies affect the ways students learn or whether school leaders and educators have integrated technology into instruction. The mismatch between a high rate of global technology use, decades of increased educational policies supporting educational technology, and the actual rate of technology use in K-12 U.S. schools relates to the conceptual framework for my study.

Ham and Cha (2009) also noted that, given the fast rise of technology integration policies in education internationally, government leaders should understand the significance of technology in curricula. Furthermore, even though international

educational policies differ, a common global need exists for technology integration in education to prepare a global workforce for the information age. Similarly, Ward and Parr (2011) indicated a lack of success in ICT reform in education caused by a disconnect between policy strategies and operational discourse rather than between operational discourse and classroom methods. In addition, Ham and Cha presented three reasons for the diffusion of the ICT curriculum: a stronger international economy, international politics among countries with varied historical courses, and the construction and dissemination of scientific and professional discourses.

According to Jackson et al. (2009), the integration of technology into any curriculum should involve learning theory and educational practices. Jackson et al. contended that, with advances in the Internet, many tools are available to educators. These tools provide opportunities for technology integration in classrooms to meet the learning needs of all students. Similar to the views of Ham and Cha (2009), Jackson et al. and Lesiko et al. (2010) noted that the United States needs citizens with technology skills to meet the nation's needs now and into the future. Ham and Cha (2009), Jackson et al., and Lesiko et al. (2010) indicated that diffusion of one-to-one computing, and technology integration in general, is a struggle in public K-12 U.S. schools.

Many experts have indicated that students need technology training to be ready for the workforce. Ham and Cha (2009), Jackson et al. (2009), and Lesiko et al. (2010) reported that the United States needs citizens with technology skills to meet the nation's future employment demands. Kolderie and McDonald (2009) contended that U.S. public schools are not keeping up with teaching technology-related skills. Akbaba-Altun and

Gürer (2008) found that administrators believed the areas related to information technology (IT) included staff development, communication, facilitation, supervision, leadership, public relations, monitoring, and ethics.

The gap between the use of digital technologies inside and outside of school is evident. Children live in digital settings enhanced by technology but go to print-based schools and acquire knowledge with a methodology that does not fit with present times (Bosco, 2011). Similar to Ham and Cha (2009), Jackson et al. (2009), and Lesiko et al. (2010), Duggan et al. (2012) noted that technology and digital learning provide the critical educational support that U.S. students need for improved academic performance and global competitiveness. The United States is struggling to compete with other countries in academic performance. Digital media has the potential to take learning in the United States to a much higher level. However, educational leaders are still slow to adopt these technologies. Rogers (2003) described the rate of adoption in the theory of diffusion of innovations, which I explored in my study because it relates to individual school leaders and classroom educators in one school.

In addition to the low rates of technology adoption in K-12 U.S. schools, the literature reviewed provided a recent historic background on the need for educational technology diffusion, educational standards, preparation and roles of school leaders and educators on diffusing technology innovations, and theory of diffusing innovations. A gap exists in previous research on the integration of technology in schools regarding views of school leaders and classroom educators. My study helps to fill this gap in existing literature. Findings of my study may also serve to inform leaders of K-12 school

districts on how to implement the adoption and diffusion of student access to one-to-one personal computing, thereby contributing to a positive social change.

Problem Statement

The social problem that I addressed in my study was that the rate of adoption of one-to-one computing in U.S. K-12 schools does not meet the requirements of educational standards or the gap in the use of digital technology inside and outside of school. Previous research has not examined the integration of technology in school based on the views of school leaders and classroom educators.

Purpose of the Study

My purpose in this qualitative case study was to analyze the perceptions of one school leader, classroom educators, and one technician from one school district regarding the integration of one-to-one computing when viewed through the lens of Rogers's (2003) diffusion of innovations process. My study involved examining levels of one-to-one computing adopters in one school district as compared to Rogers's theory of diffusion of innovations. I also examined why individuals are at specific levels of adoption of one-to-one computing and how one-to-one computing may affect instruction.

Research Questions

My purpose in this qualitative case study was to analyze the perceptions among school leaders, classroom educators, and technicians from one school district regarding the integration of one-to-one computing when viewed through the lens of Rogers's diffusion of innovations process. The overarching questions in my study were the following:

1. How do school leaders at the district and building levels view the process of integrating one-to-one technology?

2. How do classroom educators and technicians within the school view the process of integrating one-to-one technology?

Conceptual Framework

A theory represents a proposed relationship among constructs to predict or explain how a phenomenon works. According to Johnson and Christensen (2004), a theory provides predictions and creates new relationships and, in this manner, a theory can guide research. Rogers's (2003) diffusion of innovations theory served as the conceptual framework for my study. I used Rogers's theory to categorize themes that emerged in the interview responses and to explain how the views of school leaders and classroom educators affected the diffusion of one-to-one computing in one school district. Rogers described the process by which individuals adopt an innovation. Within the theory, Rogers titled Stage 1 of this process as *knowledge.* Rogers explained that in the knowledge stage, a decision-making unit becomes aware of an innovation and understands how it works. Rogers described the second stage as *persuasion*, which is when a decision-making unit forms an attitude toward the innovation. Next is the *decision* stage, which Rogers noted occurs when a decision-making unit engages in activities that prompt decisions to adopt or reject an invitation. The fourth stage of the innovation decision process is *implementation*, which Rogers described as the decision-making unit putting the decision into use. The final stage is the *confirmation* stage, which

includes seeking reinforcement of the decision already made (Rogers, 2003, p. 169). Rogers discussed the properties of innovations as follows:

1. Compatibility is the extent an innovation is consistent with the values and experiences, and needs, of possible adopters.
2. Complexity is the extent an innovation is difficult to understand.
3. Triability is the extent an innovation may be experimented with.
4. Observability is how visible an innovation is to others (p. 266). The values of individuals affect the pace of adopting innovations. Rogers (2003) noted that how quickly individuals adopt change relates to whether they value the new approach compared to their existing approach. The adoption of technological change usually takes place in stages: adoption, implementation, and continuation. In addition, individuals have varied levels of willingness to adopt innovations. I used these stages in the diffusion process to categorize some data collected in my study. Rogers (2003) categorized individuals into the following five categories of individual innovativeness:

- Innovators: venturesome, educated, multiple information sources.
- Early adopters: social leaders, popular, educated.
- Early majority: deliberate, many informal social contacts.
- Late majority: skeptical, traditional, lower socioeconomic status.
- Laggards: neighbors and friends are main information sources, fear of debt.

Rogers (2003) outlined three specific stages: adopting an innovation, diffusing innovations, and levels of individuals' willingness to adopt an innovation. In my study,

the interview questions specifically targeted these stages as they applied to the school and individuals under study. The study involved analyzing data from the responses to open-ended interview questions and organizing the responses into themes within Rogers's stages of adoption, diffusion, and individuals' levels of willingness to adopt the innovation. Rogers's theory of diffusion of innovations served as a guide for this research, as the study involved viewing relationships and predictions related to diffusion of one-to-one computing in one high school. I searched for evidence that was consistent with Rogers's model of diffusion of innovations. I discuss the theory in more detail in Chapter 2.

Nature of the Study

A qualitative case study approach was suitable for assessing the depth of views and factors that influence school leaders', classroom educators', and technicians' opinions and feelings about one-to-one computing in one school district. Johnson and Christensen (2004) noted that in a case study, a researcher presents detailed views of one case to answer questions that explore, describe, and explain a phenomenon. Yin (2014) explained that a case study can be suitable to explore and to explain a social event. A case study provides focus on one case while maintaining a holistic real-world view (p. 4). Yin contended that some of the most famous case studies were explanatory.

The interview questions were open-ended "how" questions (see Appendix A). Yin (2014) noted that one trait of a case study is that it asks how and why questions. These types of questions provide rich narratives not obtainable in quantitative methods such as Likert-type scale surveys. Rich narrative responses provided originality and detailed

descriptions. In the interviews, the participants expressed their ideas fully rather than feeling constrained to the researcher's limitations that can be set in quantitative studies. The qualitative approach provided responses subsequently analyzed and organized to determine themes or trends in the responses. In addition, the findings from this case study conducted in one school may transfer to other schools in which school leaders are attempting to diffuse one-to-one computing initiatives.

My purpose in this qualitative case study was to analyze the perceptions one school leader, classroom educators, and one technician from one school district regarding the integration of one-to-one computing in one U.S. school when viewed through the lens of Rogers's diffusion of innovations process. A gap existed in research on the integration of technology in schools and the views of school leaders and classroom educators. Evidence of this gap appears in Chapter 2.

The original target sample size was 11 participants. I was able to secure only five participants despite several attempts to include others. Initially, I contacted the school principal and she gave me the proper written permission to conduct my study. She also assigned one of her staff members to assist me with my needs. This assigned person and I had multiple contacts regarding participants. She recommended several potential participants originally, and she signed consent to participate herself. I made multiple attempts to secure participation of the recommendations. Of those, she and five others agreed to participate and returned signed consent, including one principal, four classroom teachers, and one technician. I then invited more potential participants and none agreed to participate. When I arrived at the school to conduct the interviews, one of the original

classroom educators changed their mind and did not sit down for an interview. This resulted in a final sample size of five including one administrator, three classroom educators, and one computer technician. On traveling back to my state after the interviews, I again requested more possible participants and of those recommended, none consented to participate in my study.

I purposefully selected interview participants. Merriam (2002) noted that when searching for the meaning of a particular topic from the viewpoint of participants, purposeful sampling could provide the best source of information in qualitative research. In Chapter 3, I include a discussion of purposeful sampling.

I included an interview protocol designed around the research questions and conceptual framework (see Appendix A). The initial consent agreement to participate indicated participation would involve completing an initial interview to obtain interview participants. According to Simon (2006), open-ended questions are the most frequently used instrumentation for determining variables in a study's population. Responses tend to describe more closely the real views of the respondents, and respondents are able to answer questions in their own words. Unanticipated answers can also result.

Data sources for my study consisted of interviews that generated the data needed. Both Johnson and Christensen (2004) and Merriam (2002) discussed that both interviews and documents are common primary sources in qualitative case study research. Yin (2014) explained that the strength of the case study method is that it can use multiple sources such as interviews, observations, documents, and artifacts. In addition to interviews, the documents examined included state-level technology plans, and state-

level educational technology standards being useful for comparison and triangulation purposes.

Interview responses obtained in my study underwent analysis and then the responses underwent organization by themes. On the initial reading of responses, I highlighted concepts appearing two or more times in a different color. I also went back through and labeled the various themes that emerged and coded them as Letters A, B, and so on. Next, I transferred each theme to a chart (see Appendix C) and matched each theme to the research questions and the conceptual framework. A detailed description of analysis is in Chapter 3.

Definition of Terms

Diffusion: "Diffusion is the process by which an innovation is communicated through certain channels overtime among members of a social system" (Rogers, 2003, p. 11).

Innovation: An idea, practice, or object that is perceived as new by an individual or other unit of adoption (Rogers, 2003, p. 12).

One-to-one computing: All students in a school, district, or state have their own mobile-computing device (Abbott 2014).

Rate of adoption: The relative speed of adoption of an innovation by social system members (Rogers, 2003 p. 12).

A complete discussion of Rogers's (2003) theory appears in Chapter 2. A detailed description of how data from my study apply to each construct of Rogers's theory appears in Chapter 3.

Assumptions

I assumed that participants would answer truthfully because participation was voluntary, and I preserved anonymity. Assumptions contribute to reliability and validity of the study and explain participants' knowledge on the topic.

Scope and Delimitations

One boundary of my study was the population and one-on-one experiences. The study participants were school leaders and classroom educators from one southern Georgia high school, and it was not possible to generalize to other regions or situations completely. Rogers's theory relates directly to diffusion of innovations, which is the lens through which the study took place. A detailed discussion appears in Chapter 2.

Limitations

A limitation of my study was the exploration of the ideas of a group of school leaders, classroom educators, and technicians regarding the integration of one-to-one computing access in one school district. This yielded a small sample and small population not necessarily generalizable. My purpose in this qualitative case study was to analyze the perceptions of school leaders, classroom educators, and technicians regarding the integration of one-to-one computing in one U.S. school when viewed through the lens of Rogers's diffusion of innovations process.

I had no personal or professional relationships with the participants and did not work in the school district under study. I served as an observer in the process of data collection during my study. I believe technology has the potential to improve learning. I

acknowledged this bias to ensure the objective analysis of the data on participants' views and to ensure my preexisting bias did not interfere with the results.

Significance

Merriam (2002) noted that the significance of a study might include a gap in knowledge, the answers to research questions, and the ways a study will contribute to the existing body of knowledge. The significance of a study explains the rationale for the study and informs the reader why the study is important to a given audience, including researchers, practitioners, and policy makers. My study may be significant to school leaders and classroom educators on a local and national level because integrating technology may help to meet standards and may increase student achievement. Decision makers might use the findings to diffuse one-to-one computing in K-12 U.S. schools to meet student needs, which could affect learners because it may increase achievement and workforce preparation and thereby contribute to positive social change.

Findings may help increase research that contributes to the effective integration of personal computing technology access in U.S. K-12 schools. The study might also have global significance, as ICT policies closely relate to global economics, politics, policy making, and successful implementation of one-to-one computing in U.S. K-12 education through instructional practices in the classroom. My study contributes to the existing body of knowledge and fills a gap in the literature that may assist decision makers in successfully diffusing one-to-one computing in K-12 U.S. schools. Findings may apply to U.S. K-12 education and may lead to increased research that contributes to the more effective integration of one-to-one computing in K-12 schools.

The positive social outcomes of my study may inform school district personnel struggling to implement the integration and diffusion of one-to-one computing devices for students as a means to influence learner successes. The findings could address solutions to problems that influence U.S. K-12 learners currently and in the future as related to using educational technology. My study is significant because it could contribute to closing the research gap concerning the integration of one-to-one computing in one U.S. K-12 school when viewed through the lens of Rogers's diffusion of innovations process. Adopting one-to-one computing in schools may also directly address the achievement of state and national technology standards and the academic goals for U.S. K-12 students. Students may also benefit from one-to-one technology in schools, as their academic achievement and their preparation for the workforce may improve.

Summary

My purpose in this qualitative case study was to analyze the perceptions of one school leader, three classroom educators, and one technician from one school district regarding the integration of one-to-one computing when viewed through the lens of Rogers's diffusion of innovations process. In addition, a gap existed in previous research on the integration of technology in schools and the views of school leaders and classroom educators. My study contributes to the existing body of knowledge, helps fill this gap in the literature, and may assist decision makers in successfully diffusing one-to-one computing in K-12 U.S. schools. Findings may apply to U.S. K-12 education to help increase research that contributes to the integration of personal computing in K-12 schools that is more effective.

Rapid changes in technology present challenges regarding the diffusion process of one-to-one personal computing in K-12 U.S. schools. School leadership is an important component in this diffusion process. The problem is significant because one-to-one access for students may raise achievement and may inform school district personnel struggling to implement the diffusion of one-to-one computing devices for students.

To help ensure richness of findings, depth of understanding, and reliability in the findings, five classroom educators from one school district in southern Georgia participated in the study. The study involved an attempt to understand how school leaders and classroom educators view the process of integrating one-to-one technology. Types of data sources for my study were the results of interviews and an examination of documents that included state-level technology plans, and technology standards.

Rogers's (2003) diffusion of innovations theory served to frame the study, which resulted in answers to the following research questions:

1. How do school leaders at the district and building levels view the process of integrating one-to-one technology?

2. How do classroom educators and technicians within the school view the process of integrating one-to-one technology aligned with Rogers's (2003) diffusion process?

The following chapter includes a synthesis of wide-ranging reviews of current studies. These reviews highlight important aspects of my study, such as the problem, significance, and theory. I also present major topics of educational technology standards at the local, state, and national levels; preparation for school administrators on technology

integration in classrooms; and ICT policies at the national and international levels. Historic information served as a means of defining the problem for my study and explaining the significance of the problem through time. The literature review further contains information on one-to-one computing and the conceptual framework of Rogers's diffusion of innovation.

Chapter 2: Literature Review

Introduction

This framework of my study was Rogers's (2003) diffusion of innovations theory. Based on the literature review, a gap existed in research regarding school leaders' and classroom educators' views on the integration of technology in U.S. K-12 schools. I searched for articles of studies on applying Rogers's theory to technology innovation in schools and the relationship of educational leaders' beliefs to actions in introducing innovations. It was clear that a gap existed for a number of reasons.

The search for the application of Rogers's theory to technology innovations in schools did not reveal any articles more recent than 2009. Of the articles located on Rogers's theory of applying to technology innovations in schools, more than 90% referred to higher education or K-12 schools in countries other than the United States. In my search for articles on the relationship of educational leaders' beliefs to actions on innovations in schools, some articles provided this information on teachers but not on school leaders. Last, the one article I located that was current and included schools in the United States was specific to a subculture of Native American schools, which may not easily generalize to K-12 public schools.

For decades, educational standards have been relative to the use of technology in K-12 schools. Research has shown that leaders of U.S. K-12 schools have not adopted technology at a pace consistent with the educational standards. The problem addressed in my study was that the rate of adoption of one-to-one computing in U.S. K-12 schools does not meet the requirements of educational standards or the gap between digital

technology use inside and outside of school. Farmakidis (2012) contended that although most schools have technology available for students and teachers, widespread technology integration in instruction has not yet occurred. Farmakidis said that two reasons for the lack of integration of technology are that teachers do not know how to use the technology, or that they use it ineffectively. Farmakidis noted that to address this issue, a need exist for a technology integration program. In addition, a gap that exists in previous research is the integration of technology in schools by examining the views of school leaders and classroom educators. Pautz and Sadera (2015) indicated that only recently have researchers conducted research on school leadership roles in one-to-one initiatives. Pautz and Sadera specified that researchers have not sufficiently explored the roles of school principals in one-to-one initiatives. I addressed these problems in my study by interviewing school leaders and classroom educators in one high school. I gained insight of school leaders and classroom educators on several aspects of diffusing one-to-one computing innovations. These insights include barriers and opportunities in adopting innovations, initial planning and strategies for diffusion, and rates of adoption to address the problem statement. Evidence from my literature review that supports the above insights includes works by authors such as Shuldman (2004), Spires, Morris, and Zhang (2012), Purcell, Heaps, Buchanan, and Friedrich (2013), and Johnston (2012).

Educators in most K-12 schools continue not to use technology, even though school leaders have recommended the integration of educational technology and have set educational standards for technology use. Bebell and Kay (2010) reported that school leaders have invested billions of dollars in educational technologies, which has resulted

in a nationwide ratio of students to computers decreasing from 125:1 in 1983 to 4:1 in 2002, where it has largely remained since. Despite this increase, students use computers for only a small part of the school day. The problem that I addressed in my study is that the rate of adoption of one-to-one computing in U.S. K-12 schools does not meet the requirements of educational standards or the gap between using digital technologies inside and outside of school. A gap that exists in previous research on school integration of technology is examining the views of school leaders and classroom educators.

Literature Search Strategy

The literature search was extensive and wide ranging, and it included topics of recent historic information on adopting one-to-one computing in schools. My literature review predominantly included studies on U.S. K-12 schools. Information gained from this review added evidence to my problem statement that indicated the problem has persisted for years. This historic information further provided evidence for my background statement. I searched educational standards related to technology closely because the standards provide a lot of information that indicates using technology in schools is important and the reasons why. The educational technology standards helped to demonstrate that my study is significant.

The third main area of literature searches conducted was on the views of school leaders and classroom teachers regarding technology adoption. This search included the preparation school leaders and classroom educators received to adopt technology innovations. I also searched theories on systems changes and diffusion of innovations to find the theory best suited to my study. Instructional design and development theory were

not suitable for my study because the basis of instructional design and development theory is the related more on the psychology of learning and effective communication tools. Systems theory related to change was another topic researched for my conceptual framework. After reviewing various theories, Rogers's (2003) diffusion of innovations theory emerged as the most appropriate framework for my study. Rogers's perspective provided a lens with which to view the perceptions of school leaders and classroom educators, which was pertinent to my study, as the participants were school leaders and classroom educators. Rogers's theory relates directly to the diffusion of innovations, which was under study.

The initial stage of the literature review consisted of gaining a solid topic for the study. The sources used for this exploration were the Walden library ProQuest and ERIC databases and Google Scholar, as well as class discussions and interactions with my mentor. Searches during this time focused on technology standards for schools, students, teachers, and administrators, as well as ways school leaders can diffuse or integrate educational technology in classrooms at the K-12 level. Specifically, I searched for information on the diffusion of one-to-one computing in K-12 schools as viewed by school leaders and classroom educators. I also explored the influences of one-to-one computing that change instruction.

After the topic and problem were in place, I expanded the literature review with more databases, such as Education Research Complete, Education from Sage, and Academic Search Complete. Using these databases, I expanded searches to include technology standards for K-12 U.S. schools and preparing school leaders for the diffusion

of one-to-one computing into the curriculum. Some key phrases that I used in my search included the following; *diffusion of innovations in schools*; *innovations in schools relationship with school leaders views and beliefs to diffusion*; *technology standards*; *school leaders' and classroom educators' roles in diffusing technology innovations in schools*; *diffusion, change, and systems theories*; *application of Rogers's (2003) diffusion of innovations theory to technology innovations in schools*; *one-to-one computing in schools*; *educational technology standards*; and *school leaders and classroom educators' preparation for diffusion of technology innovations.*

Not all searches provided adequate results for the study and many of the articles located were applicable but not current. Many other articles were relevant but included a focus on schools in countries other than the United States. I used previous class work and located sources I had used in readings and other papers. Certain sources such as a recent Horizon report or federal government education sites repeated data already found, so I successfully located information on those web sites. The State of Georgia Department of Education website was also a valuable resource for my study. I also continually scanned the references of articles that I used and selected specific key words that I would use for title searches to gain information on my topic. The Walden librarians were helpful in guiding me through searches to obtain the articles for review. At one point, I was finding articles online, but I was unable to access them unless I paid money. I contacted the Walden librarians who were helpful in guiding me through journal searches on the Walden site to obtain the articles I wanted to review. After exhausting research options, I included some concepts that were difficult to locate in the information on gaps in the

literature that my study could help fill, but I was unable to come up with a significant number of current articles on the topic of one-to-one computing from the view of school leaders and classroom educators. I then returned to the librarians for more assistance and searched only for technology integration. This search resulted in many articles, but most were irrelevant to my study and some indicated that research on technology integration using school leaders was lacking.

The literature search indicated training for school leaders regarding the adoption and integration of technology is insufficient. Although state and federal mandates such as educational technology standards and the No Child Left Behind Act have led to funding technology in schools, the rate of adoption and true integration has not increased due to a number of factors, including inadequate training of school leaders and teachers. Not many current studies address integrating school technology from the views of school leaders and classroom educators. My study includes some literature that is less current but that addressees the problem in my study.

I was unable to locate sufficient current research for my literature review. As noted, one reason was the limited number of studies on the topic of one-to-one computing in U.S. K-12 schools from the perspective of school leaders and classroom educators. Most of the older studies found on educational technology and one-to-one computing did not include the views of school leaders and classroom educators. Another possible reason for not finding current literature may be that researchers conducted more studies closer to the onset of school legislation such as the No Child Left Behind Act and educational standards. The thrust of federal education policy related to school performance occurred

in the early 2000s, which may explain why more studies on educational technology are from that time frame. I also included a section on historic information in my review, which includes older studies. For the reasons noted above, I was unable to find a sufficient amount of current literature on the perspectives of school leaders and classroom educators and relied in part on older studies.

The following is an extensive review of current literature related to key concepts in my study. The major sections of the review include preparation for school administrators and their role on technology integration in classrooms. Also explored are educational standards on educational technology at the local, state, and national levels and ICT policies at the national and global levels. The recent historic information serves as a means of defining the problem for my study and for providing evidence for the problem on the lack of successful integration of one-to-one computing in K-12 U.S. schools and setting up the background information for the study. Other literature reviewed included necessary components for the study such as options for appropriate conceptual frameworks and the research design.

Conceptual Framework

Rogers's (2003) theory of diffusion of innovations served as a guide in my study. Johnson and Christensen (2004) noted the function of theory in research is to create new relationships and make predictions. The conceptual framework informs through a lens that can shape what a researcher is exploring and the questions asked in a qualitative study. Conceptual frameworks of qualitative studies include an inductive process that involves gathering data and using the data to build broad themes or patterns and a general

theory while also using evidence from the literature. This concept of theories include the use of an induction component to develop themes was significant to my study, as I documented themes that emerged in the data and compared them to Rogers's theory to answer the research questions.

Two conceptual frameworks relevant to my study were Rogers's diffusion of innovations theory and systems design theory. Followers of both of these theories view the adoption of technological innovations and systems problem from a wide lens that includes the entire learning system and beyond and applying both theories might have revealed areas that prevent classroom teachers adopting technology integration. I chose to use the diffusion of innovations theory as a conceptual framework for my study. Teachers do not implement any instructional methods or curriculum in isolation; rather, the system has set policies and procedures to follow, and therefore a system approach to the study was appropriate to consider all stakeholder views.

Other theories considered for framing my study were general systems theory and instructional design and development theory. A researcher applying systems theory views the adoption of technology innovations and systems problems through a wide lens and may identify areas that prevent the successful adoption of technology integration by classroom teachers. The basis of Reigeluth's (1983) instructional design and development theory is the psychology of learning and effective communication tools. Reigeluth's theory was a possible theory for framing my study. Systems theory and instructional design and development theories did not undergo further investigation as a framework for my study, as Rogers's diffusion of innovations theory was more directly pertinent to the

topic of the diffusion of one-to-one computing in K-12 U.S. schools. I did not consider design or motivation in my researcher; rather, I examined the construct of adopting innovations.

Spector, Merrill, Merrienboer, and Driscoll (2008) presented theoretical foundations that might have applied to the research problem and questions in my study. Instructional design and development is one foundation that could have served as a framework in my study. Instructional design and development theory contains a foundation that strongly applies to my study. School leader training on technology uses in instruction was central to this research. Spector et al. noted that instructional design models are based in the psychology of learning and effective communication. The theoretical foundation of instructional design and development might have suited my study, but I rejected the theory because Rogers's theory of diffusion of innovations was more suitable for framing my study, as it specifically included the diffusion of one-to-one computing and resulting changes in instructional practices.

Rogers (2003) described the process of adopting an innovation. Stage 1, knowledge, occurs which a decision-making unit becomes aware of an innovation and understands how it works. Rogers described the second stage, persuasion, as occurring when a decision-making unit forms an attitude toward the innovation. Next is the decision stage, which Rogers noted occurs when a decision-making unit engages in activities that prompt decisions to adopt or reject an invitation. The fourth stage of the innovation decision process is implementation, which Rogers described as the decision-

making unit putting the decision into use. The final stage is the confirmation stage, which includes seeking reinforcement of the decision already made (Rogers, 2003, p. 169).

Rogers (2003, p. 266) discussed the stages of diffusion in context:

1. Compatibility is the extent an innovation is consistent with the values, experiences, and needs of possible adopters.

2. Complexity is the extent an innovation is difficult to understand.

3. Triability is the extent to which individuals may experiment with an innovation.

4. Observability is the extent an innovation is visible to others in the social system.

Rogers (2003) noted that how quickly individuals adopt change relates to whether they value the innovation compared to their existing approach. The adoption of technological change usually takes place in three stages: adoption, implementation, and continuation. My study includes an answer the question of how school leaders and classroom educators view the process of initiating change to curriculum and instructional strategies in a one-to-one technology setting compared to Rogers's (2003) five phases of the diffusion process. Rogers described five categories of adopters based on levels of innovativeness within a group over time. Innovators comprise 2.5% of adoption members and are first to adopt an innovation. Rogers described innovators as venturesome, in that they will take risks with financial resources.

According to Rogers (2003), critical mass operates at the system level, while thresholds relate to individuals. When others within an individual's personal network adopt an innovation, those individuals will adopt the innovation more readily and earlier

in the process. Critical mass becomes self-sustaining when a critical number of individuals adopt an innovation because the reciprocal interdependence and advantage of the innovation use increases. An innovation depends on the reciprocal interaction for the intended successful outcomes. Rogers explained that the critical mass is a social event in which once critical mass occurs, the social system norms will perpetuate rapid adoption by system members.

Rogers's (2003) perspective served as a lens through which to view the perceptions of school leaders and classroom educators in my study. After reviewing the spectrum of theories described that appeared to have relevance to my study, I selected Rogers's theory of diffusion of innovations as the framework for my study. Rogers's theory was significant to this exploration of school leaders' and classroom educators' views on curricular and instructional strategy change within a one-to-one computing setting because the study did not involve considering design or motivation; rather, the study involved examining the construct of the adoption of innovations.

My study involved exploring a newly implemented one-to-one setting in one high school to determine the adoption levels of leaders and classroom educators regarding the integration of one-to-one computing. In-depth questions led to responses that described school leaders and classroom educators as integrators of one-to-one computing into the curriculum and instructional strategy choice. Rogers's theory of diffusion served to guide the instruments used in the study to obtain sufficient data to answer the research questions.

School Leaders' Role in Technology Integration

My study involved exploring school leaders' and classroom educators' views on integrating one-to-one computing. Participants' descriptions of their individual roles in the diffusion of one-to-one computing at their school were significant. Participants provide information on strengths and weaknesses, as well as assets and barriers, in the diffusion process they experienced with one-to-one integration in their school. Exploring participants' preparedness, ongoing learning, and beliefs led to a rich narrative of individual stories used to answer the research questions. My study involved exploring school leaders' and classroom educators' views on their roles in the application of one-to-one computing in the classroom through interviews, which led to an examination of school leaders' and classroom educators' roles in the literature review.

The role of school leaders as discussed in this section of the literature review includes concepts such as technology policies, technology support, leader preparedness, promotion of change, training, and a clear technology integration vision. The study included an exploration of these concepts through the data collection process. Webb (2011), Polizzi (2011), Means (2010), and others have examined concepts of technology integration in schools that were similar to the focus of my study. Some research was qualitative, and other research was quantitative. The strengths of evidence from the literature reviewed included peer-reviewed articles and methods of checking the reliability and validity of the data in studies, such as triangulation and member checks, which indicate the evidence is strong and accurate. The results of different studies analyzed for the literature review were similar, which gave credibility to the findings.

My study benefited from other studies that had similar findings in a variety of ways. First, I demonstrate that the study supports previous empirical research findings on technology integration in schools. Previous studies provided guidance on methodology, major concepts to explore, and data analysis, which led to a more reliable and valid study. My findings contribute to existing literature and might lead to new concepts to explore in the future.

Webb (2011) and Pautz and Sadera (2015) noted that technology is an important component of the teacher accreditation process, faculty development, student academics, curriculum design, and resource allocation. Webb also indicated that teachers are change agents who meld technology into learning. Webb also reported that instructional leaders determine the levels of teachers' instructional technology skills. Furthermore, school leaders influence the integration of technology into the curriculum through hiring and supporting teachers. My study involved exploring the different ways teachers consider their role in implementing one-to-one computing. Webb's quantitative study provided evidence through statistics drawn from a survey that participants completed and that were important to my study because I compared my findings on teachers' perceptions of their role with Webb's findings. Change agents are an important component of Rogers's (2003) theory of diffusion of innovations, so the concept of change agents of innovations was pertinent to my study. In addition, Webb explored the support of technology integration by school leaders, the predictors of teachers' levels of technology use, and teachers' attitudes toward technology, as well as teachers' technology proficiency. All of these components examined in Webb's study related to my study.

Webb (2011) discussed the critical components that school leaders provide in ensuring teacher success and student learning with regard to integrating technology into the curriculum. Specifically, successful school leaders provide resources, support instruction, communicate, and are always present. Webb's study was significant to my study, as I explored the roles and actions of school leaders in the technology integration process. The components of successful school leaders in technology integration discussed by Webb above emerged as themes in my study. Lastly, Webb noted that the entire hierarchy of school leadership from superintendents to principals and technology leaders affects technology integration. In addition to teacher training, a clear technology message sent to the entire administration can be successful in building support for technology in the community and the school board to secure funding, widespread support, and adoption and integration of technology in schools.

Holt and Burkman (2013) also discussed the importance of school leadership related to the integration of technology. Holt and Burkman explored the challenges of technology integration, the impact of technology has on learning, and the ways district leaders can keep momentum on funding technology with all the changes that occur with technology. Holt and Burkman researched the beliefs and behaviors of top school leaders using extensive amounts of technology. These school leaders had decision-making capabilities on technology issues in the schools.

Themes that emerged from Holt and Burkman's (2013) study included budgeting issues, rapid technology changes, leaders should allow bottom-up leadership on technology, and teachers and building leaders must understand and use best practices on

technology integration for effectiveness and efficiency. School leaders also suggested moving forward slowly with technology integration to avoid overwhelming teachers and causing them to give up.

The study by Holt and Burkman (2013) was significant to my study. The study was one of only a few current articles located that had school leaders who were decision makers as participants, which is important because there is a gap in the literature on technology integration studies with school leaders as participants. My study was also similar to mine, as it was qualitative, included data gained through interviews, and contained ideas clustered into themes in the analysis.

School leaders', classroom educators', and support staff attitudes toward one-to-one computing in K-12 U.S. schools can influence the level of integration. Consistent with Rogers's theory of diffusion, Webb's (2011) quantitative study findings indicated that attitudes about classroom technology, number of technology courses teachers completed, and proficiency levels were important in predicting technology integration. Webb conducted the study to provide school administrators with information needed so they could predict the technology background necessary to lead appropriate technology integration in the classroom. Webb's study contains items that assist in predicting technology integration. I was able to compare my findings to Webb's to determine if any items such as attitudes or technology training levels would emerge as significant themes.

The concept of attitudes addresses Rogers's (2003) level of adopters. Webb (2011) contended that prior research indicated that first-year teachers are not fully able to integrate technology. Webb noted this lack of integration could be because so much time

is necessary to start a classroom and because of the lack of administrative support offered for technology integration. Webb provided useful information for administrators to consider when prioritizing for teacher support of technology integration in the curriculum. Webb further noted that administrative support and time given to teachers significantly affected teachers' integration of technology. These concepts presented by Webb related to my study because I asked school leaders and classroom educators in my study about the training and support received for the diffusion of one-to-one computing in their school.

Finally, Webb (2011) recommended the following actions by school leaders to promote the use of technology:

1. Administrators should become informed about new teachers' technology backgrounds and attitudes on technology integration.
2. Administrators should support new teachers to affect attitudes about technology integration.
3. Administrators should provide training opportunities on technology integration for new teachers.
4. Administrators should provide incentives such as time or technology resources for new teachers, especially at the start of the school year.
5. Administrators should be knowledgeable about technology and provide guidance concerning technology integration.

These five suggestions by Webb helped to frame questions for the administrators who participated in my study.

Rogers (2003) contended that attitudes are important for determining the level of adoption of technology. Challoo, Green, and Maxwell (2011) conducted a study to examine the relationship between teachers' attitudes and beliefs about technology and levels of technology adoption. Challoo et al. claimed that teachers' adoption of technology is crucial to the success levels of technology integration. Their findings revealed that the comfort levels of teachers with technology were the most important factor in the adoption of technology in the classroom. The results indicated a strong correlation between teachers' adoption levels and their interest in technology. Teachers' interest levels had a strong effect on their comfort levels with technology. Because teacher comfort and interest levels in technology affect the adoption of technology, Challoo et al. recommended that school leaders should address comfort and interest in teachers' professional development and suggested that increasing teachers' comfort with technology would significantly raise teacher levels of technology adoption. Rogers (2003) noted that teachers must understand the advantages of technology to increase their level of interest and comfort in adopting technology. Challoo et al. claimed that providing teachers with experience and practice using technology would cause an increase in their comfort levels. The study by Challoo et al. was relevant to my study because it related to the concept of attitudes and innovation adoption as described by Rogers (2003).

Farmakidis (2012) also addressed the factor of teachers' attitudes toward determining whether they adopt and integrate technology into classroom instruction. Farmakidis presented findings from a study that indicated levels of teacher anxiety regarding technology significantly influenced teacher innovativeness and levels of

technology adoption. Chien (2013) also examined teachers' attitudes and beliefs about technology. The findings in the literature on the importance of attitudes and the adoption of technology were important to my study because I compared my findings to these studies. Studies for this literature review confirmed Rogers's (2003) theory of diffusion of innovations relative to attitudes and levels of adopters of technology, which were also important to my study framed by Rogers's theory.

Thompson (2012) explored the impact of one-to-one computing in one high school in the United States. Findings included a significant link between the integration of technology and student achievement. The correlation between professional development the level of technology integration in lessons was positive, and increases in both teacher and student attitudes toward technology use following integration of one-to-one in classrooms were significant. The study by Thompson was highly relevant to my study in a number of ways. First, Thompson's study included qualitative methods and a case study, as did my study. Next, the study by Thompson took place in one high school, which also occurred in my study. Last, my study and Thompson's study both had teachers, school leaders, and other stakeholders as participants, and I sought the perceptions of a similar population.

Ramirez (2011) examined perceptions school leaders held on the topic of factors that support successful technology integration in instruction. The school leaders who participated in Ramirez's study were one central office administrator, three school principals, one school counselor, one school librarian, three teachers, and one technology trainer, which was significant because few researchers have examined the perceptions of

school leaders regarding the integration of one-to-one computing in schools. A gap existed in the area of studies with school leaders as participants, and Ramirez's study was one of only a few in this literature review. The roles of the school leaders in one-to-one computing adoption included purchasing technology, training teachers, long-range planning, developing district policies on technology, providing incentives to motivate teachers to attend computer trainings, and collecting teacher input on one-to-one computing. All these roles contributed to the successful integration of technology in the schools.

Ramirez (2011) also identified barriers or problems the district faced with the integration of technology. One barrier was the lack of paid support for the integration. Ramirez also found that school officials lacked knowledge on technology uses and long-range planning to sustain the integration. In addition, requirements at the state level for certifying staff for technology use were lacking.

Ramirez (2011) found that participants had a variety of beliefs regarding purchasing technology. Some thought principals purchased it, others thought the technology director purchased it, and some believed central administrators purchased the technology. A similar variety of responses occurred regarding technology funding. Responses to questions about who implemented staff development for technology and technology integration practices also resulted in a variety of opinions from participants. Teachers also revealed that they felt strongly that professional development must occur in the schools to have a successful implementation of technology. Ramirez recommended that central administrators need to be responsive to teachers' needs surrounding

technology and be willing to commit resources for sustaining technology. Last, Ramirez recommended that the technology director must communicate practices and policies on technology initiatives to all district staff to ensure success with technology integration.

Hadjithoma-Garstka (2011) conducted a case study on principals' leadership styles related to implementing technology. Hadjithoma-Garstka noted the principal's leadership style is a personal quality, rather than transformational leadership behavior. Principals also have a role in technology implementation as promoters of change and innovation. The concept of change agents is similar to my study because it closely relates to my conceptual framework. Change agents represent a level of adopters noted by Rogers (2003). Furthermore, Hadjithoma-Garstka explored how to convince participants to adopt one-to-one computing.

Hadjithoma-Garstka (2011) found that staff relationships and the school climate influenced the implementation process. Merriam (2002) confirmed climate, relationships, and school culture are important components in a qualitative study. During the study of Hadjithoma-Garstka, the school most successful in implementation received support from other local initiatives, and the principal emphasized a people-first leadership style. An implication drawn from the study by Hadjithoma-Garstka was to train principals on technology use and technology integration and to inform them of different leadership approaches to adopt to promote implementation at the early stages.

Polizzi (2011) reported the findings of a qualitative study regarding the important strategic role that school principals have in implementing the integration of technology in teaching. Polizzi framed the study with Rogers's diffusion of innovation model to explore

the role of principals' attitudes among other variables and contended that the integration of technology in schools is a cultural issue that means school district leaders must encourage positive attitudes and acceptance of the tools among end users. Both Webb (2011) and Polizzi found that attitudes and cultural issues affect the acceptance of change and the adoption of new ideas, as also supported by Rogers's diffusion of innovations theory with discussion on attitudes and change. The concept of attitudes relating to the diffusion of innovation emerged in my study. Strengths of the Polizzi study when comparing it to my study were that it was a qualitative study and Polizzi used Rogers's theory of diffusion of innovations to frame the study.

Diffusion of one-to-one computing in U.S. K-12 schools has not kept pace with the educational technology standards. Means (2010) noted, "Despite decades of national, state, and local promotion of educational uses of technology, classroom practice in most schools has changed little of that of the mid-20th century" (p. 285). Means (2010) studied the implementation of educational technology as related to student achievement by comparing student achievement in schools where teachers used reading and math software to schools where teachers were not using such software. Means concluded that student achievement at the schools where teachers were using the literacy and math software was higher than in the comparison schools. Of significance to my study was that Mean's findings indicated the importance of principals' support for successful technology integration and student achievement.

Leadership Standards

Educational standards demonstrate how federal, state, and local policy makers and others view funding of the integration of technology in K-12 U.S. schools as a significant need. School leaders use standards to make decisions. Educational standards for technology integration exist at the local, state, and national levels. The standards indicate the importance of integrating technology in U.S. K-12 classrooms. School leaders have adopted these standards in K-12 U.S. schools at a faster pace than the actual use of technology in those schools. I explored the local and state standards for the school in my study with participants as factors in the adoption levels of changes in curriculum and instructional strategies in a one-to-one computing setting.

Bosco (2010) provided a historic perspective on the design of core technology standards for school administrators and discussed the Collaborative for Technology Standards for School Administrators (TSSA), designed in 2001. TSSA created this collaborative to design technology standards for preK-12 administrators. Furthermore, the collaborative recognized the major role that school administrators play in successful technology integration. The collaboration indicated that administrators should be skillful as technology users and in leadership roles to provide digital equity. Administrators need to integrate technology as it aligns with the vision of the district and curriculum initiatives as set out in the standards created by TSSA.

According to Bosco (2010), the TSSA designed six core technology standards for all levels of school administration. The TSSA broke down these six standards further as

they related to the various roles of superintendents, central administrators, and building principals:

1. Educational leaders inspire a shared vision for the comprehensive integration of technology and foster an environment and culture conducive to the realization of that vision.
2. Educational leaders ensure curricular design, instructional strategies, and learning environments integrate appropriate technologies to maximize learning and teaching.
3. Educational leaders apply technology to enhance their professional practice and to increase their own productivity and that of others.
4. Educational leaders ensure the integration of technology to support productive systems for learning and administration.
5. Educational leaders use technology to plan and implement comprehensive systems of effective assessment and evaluation.
6. Educational leaders understand the social, legal, and ethical issues related to technology and model responsible decision making related to these issues.

Donlevy (2004) also reported on the TSSA technology standards. Donlevy contended that given the rapid advances in IT, competence in the area of technology should be a priority in training upcoming school administrators.

Donlevy (2004) reported that the first TSSA standard calls for educational leaders to incorporate all stakeholders in the development of a vision for technology to incorporate into a long-term strategic plan. The second standard is on instruction that

guarantees technology use for optimum student achievement and faculty professional development. Donlevy explained that Standard 3 requires that administrators model technology use, encourage technology integration, and be up to date on emerging technologies. Standard 4 relates to administrators' allocation of funds and human resources to achieve technology plans. The fifth standard requires administrators to use a variety of assessment methods for technology use in schools as well as using technology to collect, analyze, and communicate data to stakeholders. Donlevy noted the sixth standard requires equal access to technology and promotes security and safety for all learners as well as maintaining intellectual property rights.

Members of The International Society for Technology in Education (ISTE, 2011) set technology standards for school administrators that are similar to the TSSA standards. The five overarching ISTE technology standards are vision, culture, practices, improvement, and digital citizenship. The first standard was the facilitation of a vision and plan to raise achievement through technology integration. The learning culture standard focused on innovation, modeling, technology facilities, curriculum immersed with technology, and advancement of collaboration. These two standards parallel the TSSA's technology standards for administrators.

The third ISTE administrative technology standard promoted professional development for teachers on technology through the provision of resources, modeling collaboration, and remaining up to date with current technology. The ISTE's Standard 4 promoted use of IT though leading change, using data to increase learning, securing strategic partners, and maintaining the technology infrastructure. The last ISTE

technology standard for school administrators encompassed the legal and ethical responsibilities of technology use. This standard included the assurance of equitable access for all students, setting policy for safe practices, and facilitation of a collaborative environment through technology to raise awareness of global issues.

The recent ISTE standards on technology for school administrators echoed those of the 2001 TSSA. It is critical for current and future school administrators to receive effective training in using educational technology to be effective leaders for advancing the integration of technology in the curriculum. The ultimate result of this leadership is advancement in student achievement and a well-prepared workforce for the digital age.

State Curricular Standards

The Georgia state public school system uses the National Technology Student Standards for Students (NETS-S) as a guide. The four strategic goals in the strategic plan are as follows:

1. Highest student achievement.
2. Seamless articulation and maximum access.
3. Skilled workforce and economic development.
4. Quality effective services.

An outline of the NETS-S that guide student technology standards in Georgia schools follows.

National Educational Technology Standards for Students

The National Educational Technology Standards for Students (NETS-S) include six broad categories. Teachers are to introduce and reinforce standards within each

category to ensure students master them. Teachers can use the standards as guidelines for planning technology-based activities in which students achieve success in learning, communication, and life skills.

1. Basic operations and concepts.

   Students:

   a. Demonstrate a sound understanding of the nature and operation of technology systems.

   b. Are proficient in the use of technology.

2. Social, ethical, and human issues

   Students:

   a. Understand the ethical, cultural, and societal issues related to technology.

   b. Practice responsible use of technology systems, information and software.

   c. Develop positive attitudes toward technology uses that support life-long learning, collaboration, personal pursuits and productivity.

3. Technology productivity tools.

   Students:

   a. Use technology tools to enhance learning, increase productivity, and promote creativity.

   b. Use productivity tools to collaborate in constructing technology-enhanced models, preparing publications, and producing other creative works.

4. Technology communications tools.

   Students:

a. Use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.
b. Use a variety of media and formats to communicate information and ideas effectively to multiple audiences.

5. Technology research tools.

   Students:

   a. Use technology to locate, evaluate, and collect information from a variety of sources.
   b. Use technology tools to process data and report results.
   c. Evaluate and select new information resources and technological innovations based on the appropriateness to specific tasks.

6. Technology problem-solving and decision-making tools.

   Students:

   a. Use technology resources for solving problems and making informed decisions.
   b. Use technology in the development of strategies for solving problems in the real world (ISTE, 2011).

The hierarchy of the standards of education for the Georgia state school system progresses from broad statements to specific statements. For example, the broadest is subject area, followed by strands through standards and benchmarks and onto sample performance. The state hierarchal standards organization includes strands and within each strand are one or two standards. Strands are the most general category:

Strand 1.0: Planning

Strand 2.0: Management

Strand 3.0: Finance

Strand 4.0: Technical and production skills

Strand 5.0: Technology

Strand 6.0: Labor

Strand 7.0: Community issues

Strand 8.0: Health, safety, and environment

Strand 9.0: Personal conduct (U.S. Department of Education).

The benchmarks are the most detailed level within the standards hierarchy. Each benchmark provides the expectations regarding what students should know for each standard. The benchmarks include synthesized sample performance descriptions. Performance descriptions include a variety of ways that teachers require students to demonstrate the ability to apply the benchmark expectations.

The last of the hierarchy is the correlation to Goal 3 standards. There are four strategic goals supported by the Georgia State Board of Education. The standards for applied technology skills, which focus on Goal 3, are the heart of the technology standards related to school and work.

The technology goals and standards for school districts in the state of Georgia appear within other curricular content area standards so teachers can incorporate them into their instruction and assessment practices, referred to as transdisciplinary abilities. The standards relate to applied technology skills and school learning applying in the

workplace because the processes and skills in applied technology include mental processes such as locating and organizing information and using this information for problem solving and in production. These applied technology skills are significant in all subject areas of school, as well as in real-world situations in the home, community, and workplace. (U.S. Department of Education).

Standard 1: Information managers

Standard 2: Effective communicators

Standard 3: Numeric problem solvers

Standard 4: Creative and critical thinkers

Standard 5: Responsible and ethical workers

Standard 6: Resource managers

Standard 7: Systems managers

Standard 8: Cooperative workers

Standard 9: Effective leaders

Standard 10: Multiculturally sensitive citizens

Standard 11: Parental involvement (U.S. Department of Education).

The standards above include 10 specific to student outcomes and apply to all subjects at all grade levels, pre-K through 12, and postsecondary education. Standards are used as guides to for administrators to hold students and teachers accountable for these standards through assessments. Standards include finding, interpreting, applying, assessing, and storing information through the Internet. Another standard refers to effective communication of students. Effective communication refers to the capacity to

convey thoughts, ideas, and data purposely. For example, students must communicate in English but also through languages of math notations, science terminology, musical notations, computer terms, and more. Some activities used in classrooms to achieve communication skills are starting and maintaining conversations, multimedia presentations, writing letters of application, and viewing and analyzing technology activities.

According to Standard 3, students use numeric operations and concepts to describe, analyze, communicate, synthesize numeric data, and identify and solve problems (U.S. Department of Education). Students should demonstrate ability to analyze and solve math problems related to school, home, and work. The goal is for learners to understand how to solve real-world employment decisions. Examples of activities students must master include analyzing, planning, and presenting project costs, organizing and developing a business plan, and using graphs, charts, and verbal presentations that they create to explain statistics.

Another standard relates to using creative thinking skills to generate new ideas, make the best decision, recognize and solve problems through reasoning, interpret symbolic data, and develop efficient techniques for lifelong learning (U.S. Department of Education). Students learn to solve problems creatively and must use scientific methods, statistical analysis, trial and error, and simulation in problem solving. For example, teachers may require students to develop and analyze budgets.

Another standard indicates that students should display responsibility, self-esteem, sociability, self-management, integrity, and honesty (U.S. Department of

Education). The intent for this standard is to teach students to become responsible and ethical workers with positive social skills, honesty, and good self-esteem. Younger students work on sharing and working with others. Intermediate level children work on both working independently and in cooperative groups. Older students learn more responsibility and more about teamwork using service learning. College level students learn about legal and ethical issues and practices for various industries.

According to another standard, students should be able to allocate time, money, materials, and other resources appropriately (U.S. Department of Education). The intention is for students to be proficient managers of time who can make timelines, prepare budgets, and allocate resources. Students may need to demonstrate skills with time management at home, school, or work or they may need to manage technologies and other tools in a technology task.

The ability to integrate knowledge and understand how social, organizational, informational, and technological systems work with students' abilities to analyze trends, design and improve systems, and use and maintain appropriate technology is another expectation (U.S. Department of Education). This standard relates to the ways systems work and using systems to solve problems. Young children may learn how the system of lunch schedules work at school; middle school children may learn about governments; high school students may learn about computer systems, operating systems, and spreadsheets; and college-level students may learn a distinct system of manufacturing.

Students should also be able to work cooperatively to complete a project or activity (U.S. Department of Education). One standard refers to social skills at a personal

level. The standard is suitable for interpersonal task-oriented skills in group work. Students should also be able to establish credibility with their colleagues through competence and integrity and help their peers achieve goals by communicating their feelings and ideas to justify or negotiate successfully a position that advances goal attainment (U.S. Department of Education). Students learn to be leaders who value communication, treat others with fairness, and realize differences between personal and work issues.

Another standard indicates that students should appreciate their own culture and the cultures of others, understand the concerns and perspectives of members of other ethnic and gender groups, reject stereotyping themselves and others, and seek out and use the views of persons from diverse ethnic, social, and educational backgrounds while completing individual and group projects (U.S. Department of Education). Students should learn about their own culture and the cultures of others. Students also learn about the need to respect others and their beliefs, customs, and values.

The Georgia school systems vision statement is as follows:

> Georgia will have an efficient world-class education system that engages and prepares all students to be globally competitive for college and careers. To equip all Georgia students, through effective teachers and leaders and through creating the right conditions in Georgia's schools and classrooms, with the knowledge and skills to empower them to 1) graduate from high school, 2) be successful in college and/or professional careers, and 3) be competitive with their peers throughout the United States and the world (U.S. Department of Education).

School leaders uphold the vision for schools in the state of Georgia with high expectations and standards that integrate technology knowledge and skills to prepare students for higher education and the workforce.

In addition to all the standards related to educational technology discussed, the Rehabilitation Act of 1998 (Section 508) mandated standards for assisting learners with disabilities (National Forum on Education Statistics, 2011). These standards may help to ensure equitable access to information through the Internet in such a way that people with disabilities can understand, navigate, interact with, and participate. As a part of the endeavor based on Section 508, the World Wide Web consortium created accessibility guides for web designers that will provide access for learners with disabilities. The technology standards included in Section 508 are extensive. The aim of these standards is often toward people with disabilities who have visual impairments and physical disabilities that may limit their ability to navigate a computer.

Students with disabilities often require assistive technology devices so they can successfully use the technology that other students without impairments can access. Some of these standards are as follows:

- Keyboards can perform any function performed by a mouse.
- Software operating systems must have no ability to disable visual and auditory features previously activated by a user.
- Application focus must be recognizable by assistive technology.
- All visual tools must have descriptive and status text.

- Animation programs are not always available on assistive technology so other forms of alternate presentation must be available.
- Because flickers, flashes, or blinks can trigger seizures, certain frequencies are not permissible.
- Rows and columns in data tables must have labeled headers
- Meaningful content must appear in code and applications for display of the content to be readable by assistive technology devices.
- Users must have the option of being given a prompt to request more time to enter responses when applications time out in a set amount of time (National Forum on Education Statistics, 2011).

Many safeguards exist in Section 508 to ensure students and others with disabilities have equitable access to information on the Internet. Bosco (2001), Donlevy (2004), and national and state technology standards in schools provided evidence of the importance of technology integration in U.S. K-12 schools that was the focus of my study.

Integration of Technology Into Curriculum and Policy

Ham and Cha (2009) reported on the rapid pace of technology development and how ICT has changed global society and education specifically since immersed in the information age. Ham and Cha reported that global agencies began providing reasons why teachers should use technology to enhance learning in the late 1970s. In addition, Ham and Cha discussed the 2000 charter by the Group of Eight heads of state. The charter recommended providing schoolchildren with more access to technology to develop ICT literacy. The views of Ham and Cha argue that school leaders around the

world have developed ICT curriculum policies and that their integration is necessary because it influenced the curricula of individual countries. Ham and Cha's study related to mine because they studied the pace of diffusion of innovations in education and demonstrated the importance of diffusion of technology innovations on a global level.

Ham and Cha (2009) discussed the rapid diffusion of national policies of ICT in education. In 1981, only 12% of the 67 countries reporting had national policies on ICT in education. The percentage increased to 69% in 2000. Ham and Cha noted that given the rise of technology integration in education internationally, government leaders all need to view the significance of technology in curricula. Even though the educational policies differ, there is a common global need for technology integration in education to prepare a global workforce for the present information age.

Ham and Cha (2009) also presented three reasons for diffusing the ICT curriculum: strengthening an international economy, international politics among countries with varied historical courses, and the construction and dissemination of scientific and professional discourses. The findings presented by Ham and Cha were important to my study. The findings demonstrated the need for the further integration of technology in education and explained why this is so important both in the United States and globally. Ham and Cha also indicated that the pace of making policies on the diffusion of educational technology is faster than the actual diffusion of technology in K-12 schools.

Similar to Ham and Cha (2009), Jackson et al. (2009) noted that the integration of technology into any curriculum should have learning theory and educational practices as

a guide. Specifically, Jackson et al. claimed learners use a diverse set of strengths among their senses to learn in a way best suited to them as individuals. Jackson et al. noted that technology could easily engage learners through multimedia presentations and tap into the variety of learning styles. Jackson et al. indicated that a wealth of tools is available to educators given resources on the Internet. These tools provide opportunities for technology integration in classrooms that can meet the learning needs of all students.

Similar to the views of Ham and Cha (2009) and Jackson et al. (2009), Lesiko et al. (2010) contended that the United States needs citizens with technology skills to meet the nation's needs. All three studies were relevant to my study and provided evidence on the significance of the topic and problem addressed in my study. Lesiko et al. conducted a study to determine if student achievement increases with additional technology instruction from a technology coordinator. Lesiko et al. sought the answer to this question to provide evidence that may show school administrators how to improve the integration of technology into the classroom curriculum of K-12 schools.

An increase in students learning curriculum content and technology skills when a technology coordinator participates in teaching lessons using technology was Lesiko et al.'s (2010) most significant finding. Lesiko et al. further concluded that access to technology resources is insufficient at the elementary grade level. Consequently, it is difficult to plan technology lessons. Lesiko et al. added that technology coordinators need to ensure equitable access to technology for all learners.

Kolderie and McDonald (2009) demonstrated that the integration of technology in U.S. K-12 schools is emerging slowly. Kolderie and McDonald contended that U.S.

public schools are not keeping up with teaching the technology-related skills needed for students to perform successfully in the labor market. The study by Kolderie and McDonald related well to my study in the area of educational standards regarding student technology use and employment skills and contributed to the reasons for the diffusion of technology innovations in schools. Kolderie and McDonald indicated that the traditional models of mass production in schools in the United States no longer meet the labor needs of mass customization provided by IT. Government at the federal and state levels should become highly instrumental in reforming schools into innovative systems of learning that use IT and prepare students for the labor force (Kolderie & McDonald, 2009).

Kolderie and McDonald (2009) stipulated that the federal government should lead school reform by encouraging states' school leaders to create new school models that use IT. In addition, Congress should give funding to states for school reform that emphasizes IT. Third, Kolderie and McDonald contended that federal laws should be more flexible in the assessment of new schools using IT rather than continuing to hold them accountable under the same No Child Left Behind requirements. Kolderie and McDonald reported that 60% of high school graduates in the United States are not proficient in writing, critical thinking, and teamwork. These skills are significant to have to be competitive in the labor market. Kolderie and McDonald argued that all state's school leaders should establish new school reforms using IT as the central method.

Similar to Lesiko et al. (2010), Kolderie and McDonald (2009) promoted collaborative project-based lessons. These two studies related to my study because school leaders and classroom educators may discuss the use of technology in their school to

promote student achievement. The studies by Lesiko et al and Kolderie and McDonald also addressed the educational technology standards I reviewed. Collaborative work promotes critical thinking, communication, and problem solving, which mirrors the types of work done in the modern workforce. Kolderie and McDonald claimed that the proposed school reform centering on IT would be more engaging and motivating for learners and would raise achievement. Kolderie and McDonald also noted that this type of new school model would be cost effective because it would not require additional personnel whose salaries make up the majority of school budgets. In addition, a new IT pedagogy in education would benefit teachers because planning and presentation time decrease with this constructivist approach.

Despite federal legislation and national technology plans, making technology significant in K-12 U.S. classrooms has yet to happen in the United States. Classrooms do not have adequate technology integration in the curriculum to meet No Child Left Behind mandates or to prepare learners for the 21st-century workforce (Roward, 2000). The studies by Plaire (2008) and Roward were relevant to my study because they provided some background and recent historic information on technology integration in K-12 U.S. schools. Few researchers have conducted empirical research on the integration of technology in K-12 schools and explored the views of system members and school leaders. Rogers (2003) noted in his diffusion of innovations theory that how quickly individuals adopt change relates to whether they value the innovation more than the existing approach. Adopting technological change usually involves three stages: adoption, implementation, and continuation.

Ham and Cha (2009), Jackson et al. (2009), and Lesiko et al. (2010) conducted research that found evidence on the importance of technology integration in U.S. K-12 schools. Some findings in prior research included the slow pace of technology adoption, the significance of school technology integration to prepare students for the workforce, and the existing technology standards at the national level. This research was beneficial for my study as it provided empirical data that supported the direction and findings of my study. These concepts studied in previous research also served as part of an outline of key concepts examined in my study. A gap existed in previous research on school integration of technology related to the views of school leaders and classroom educators, which gave me an opportunity to fill this gap in the literature.

Chien (2013) conducted research to examine teachers' attitudes and beliefs about technology. Chien also explored challenges faced with the integration of technology in schools and contended that there are many barriers to technology integration. One of the most important factors for technology integration success noted by Chien is teachers' attitudes and beliefs. Teachers' willingness to try new ideas is crucial to the success of technology integration in schools. Chien argued that there is a significant need to integrate technology in U.S. schools, but noted that school technology use primarily involves practice and word processing with limited integration into instruction.

Chien's (2013) findings showed a high level of enthusiasm and optimism toward technology by teachers. In addition, the more knowledge teachers had about technology, the more they believed in integrating technology into instruction. Most teachers who

participated in Chien's study viewed the role of technology as crucial to success but the value of technology depends on its use in instruction.

One finding from Chien's (2013) study was barriers to technology integration in schools. Participants discussed several barriers, including individual incompatibility, concern for unknowns, concerns of levels of organizational support, and concern about organizational incompatibility. Although respondents held positive attitudes and beliefs about technology integration, they also reported that they had not integrated technology as much as they wanted to because of limitations. The limitations included the unavailability of hardware and software, lack of time, lack of technical or administrative support, lack of resources, and limited skill levels.

Chien's (2013) study included an emphasis on teacher attitudes, technology adoption, and barriers to technology adoption. I explored teacher attitudes in my study, as they related highly to the conceptual framework of Rogers (2003). I also explored barriers to integrating educational technology.

Historic View of School Leader Technology Preparation

The historical research reviewed for this literature review emphasizes the slow pace of one-to-one computing integration in U.S. K-12 schools. Some research indicated the rate of one-to-one integration in schools is hindering students as they enter the workplace. This recent historic perspective helps to explain the problem addressed in my study.

Empirical data that support the case to increase one-to-one student access to personal computing in schools are missing. The lack of data is especially evident when

searching for studies on technology integration from the views of school leaders and classroom educators. My study contributes to the existing body of knowledge that supports one-to-one student access to personal computing in school. Daggett (2008) noted that most students in the United States learn most of their technology skills outside of the school setting. These student skills include critical thinking, problem solving, technical skills, and communication. Daggett supported instructional practices that acknowledge and support the technical skills that students possess and that use these skills to teach other applications to solving problems.

Historic research provides information regarding school leaders' preparation for integrating technology in K-12 U.S. schools. Donlevy (2004) noted that school administrator preparation in the area of technology integration remains limited. In the early 2000s, training programs did not have enough Internet access for research, and instructors did not have the proper media tools for presenting instruction. According to Donlevy, school administrators were inadequately trained on essential issues of technology that in college. Donlevy provided a historical perspective, but the conditions may no longer be true in many school districts.

Donlevy (2004) proposed steps for preparing school administrators for the successful integration of technology in schools. First, Donlevy recommended filling classrooms with current technological tools. Next, training for professors of educational leadership in how to use these tools should be available, followed by proof of professors' proficiency using these tools. Last, future school leaders in preparation programs need to demonstrate competence in the use of technology. Donlevy concluded that by

incorporating technology into all courses, new school leaders would be more likely to enter the workforce prepared to meet technological challenges. Knowing how school leaders perceive their own preparation to integrate one-to-one computing in K-12 U.S. education is valuable. Donlevy provided a historic perspective for my study on discussions of school leaders' preparation for technology integration.

Redish and Chan (2007), Davis, Darling-Hammond, LaPointe, and Meyerson (2005), and Hess and Kelly (2005) have noted that the preparation for school principals and other school leaders has been inadequate for years. In addition, these scholars have found that the training of school leaders was lacking in many significant areas, including the integration of school technology. In fact, just as Redish and Chan and Davis et al. found that preparation for school leaders in technology has been unsatisfactory for years, Hess and Kelly found that there has been a significant amount of concern about school leadership programs. Specifically, Hess and Kelly found that school leaders lacked sufficient preparation to handle the rapidly evolving technological aspects of educational technology. In addition, these preparation programs have not undergone meaningful change to prepare school leaders more effectively. Similar to Donlevy, Redish and Chan, Davis et al., and Hess and Kelly provided a historic perspective for my study regarding school leaders' preparation for technology integration.

Davis et al. (2005) discovered that the preparation of school principals and superintendents on technology needed major reform. Davis et al. also cautioned that the number of demands and responsibilities within the roles school leaders must fulfill is significant. Technology integration and use by administration is just one aspect of the

several roles school leaders must fulfill. Davis et al. reported that findings of a Stanford University study revealed that even school leaders expressed that they needed increased training, internship experiences, and mentorship in the scope of technology integration. Davis et al. pointed to the ISLLC standards designed to help improve preparation programs in school leadership. A discussion of the ISLLC standards appeared in the section on standards.

Redish and Chan (2007) offered another historical perspective by noting that colleges are not training school administrators fast enough in areas of technology, despite evidence of the importance technology training for effective school leaders. Redish and Chan found that aspiring school administrators at the elementary grade levels received a failing grade in preparation related to technology, and middle and high school administrators had average training on technology. Redish and Chan revealed that aspiring school principals believed that training in technology was below average. I compared and contrasted the findings of my study with these historic views on school leaders' technology integration training.

Redish and Chan (2007) noted that school principals in training indicated specific weaknesses in college training. Programs lacked instruction on the basic knowledge of technical problems as well as on how to evaluate the usefulness of the technology. Although budgeting and acquiring resources is in part the responsibility of school principals, instruction on allocating technology resources was not adequate in the principal programs. Last, the principals included in the study reported that monitoring student technology skills and progress was not sufficient in preparation programs. A

summary of weaknesses in the principal training programs indicated that training in the area of technology was inadequate.

According to Redish and Chan (2007), the main reason for the inadequacy was that while educators taught compartmentalized technology skills, they did not teach the synthesized management skills of the entire technology system in schools. Recommendations included that the designers of school leader preparation programs should maintain a focus on the existing program strengths while setting the goal of higher standards in school administrator preparation programs.

Additional findings by Redish and Chan (2007) were that effective school leaders in the area of educational technology actually model technology use, support the use of technology in instruction, and provide professional development opportunities for teachers. School administrators also need to arrange technical support and classroom resources necessary for successful technology integration. I compared and contrasted my findings on effective school leaders in technology integration to Redish and Chan's findings.

Instructional practices that use one-to-one computing as well as specific skills students learn with one-to-one tools underwent examination in my study. Daggett (2008) contended that most students in the United States are learning most of their technology skills outside of the school setting. These student skills include critical thinking, problem solving, technical skills, and communication. Daggett supported instructional practices that acknowledge and support the technical skills that students possess and use these skills to teach other applications to solving problems. By addressing the students'

interests and skills, the best possible opportunities for meaningful learning and optimal preparation for the 21st-century workforce will occur. It was interesting to see if Daggett's findings hold true in the experiences of the school leaders and classroom educators participating in .

Akbaba-Altun and Gürer (2008) conducted a study to determine the perceptions of school administrators on their roles related to technology in education. This focus was relevant to my study, which also involved examining school leaders' roles and perceptions related to technology integration. Akbaba-Altun and Gürer found that administrators believed their roles related to IT included staff development, communication, facilitation, supervision, leadership, public relations, monitoring, and ethics.

Akbaba-Altun and Gürer (2008) also found that when teachers integrate technology into their teaching, school principals have the role of facilitator and instructional leader. Principals must also obtain necessary technical support for teachers, which require budgeting priorities to obtain the needed support and equipment that teachers need to integrate technology successfully into the teaching and learning process.

This historic review section included a comparison of current literature related to my study to determine if the integration of technology has changed in recent years. For example, Redish and Chan (2007) and Davis et al. (2005) reported that school leaders had little training on technology integration in U.S. K-12 schools.

Daggett (2008) and Akbaba-Altun and Gürer (2008) found that school leaders view their role in integrating technology in U.S. K-12 schools includes placing emphasis

on professional development. It was interesting to note whether participants in my study viewed an emphasis on professional development as a significant part of their role in technology integration. Another area discussed in the historic review section was the slow rate at which U.S. K-12 schools have been integrating technology. Again, my study confirmed the idea of slow rate of technology adoption but challenged the idea of school leader emphasis on professional development.

Recent Views of School Leader Technology Preparation

School administrators and other school leaders can have a major influence on technology integration in K-12 U.S. schools. Holt and Burkman (2013) noted that school leaders set the climate for integrating technology in schools as well as allocate resources. School leaders have had very little formal training on the topic of technology integration, which is a barrier (Holt & Burkman, 2013). Similar to Akbaba-Altun and Gürer (2008), Miranda and Russell (2011) found that principals' use of technology and principals' discretion on spending resources on technology are major factors that influence instructional technology use in elementary classrooms. Of significance was the finding that principals' training highly affects the successful integration of technology in classrooms. Furthermore, Miranda and Russell found that school leaders who have a strong technology vision and technology plan are more apt to use instructional technology in their teaching. Richardson and McLeod (2011) also revealed that 100% of school principals in their study believed that their technology vision was the key to technology leadership, which was meaningful to my study because I also studied the school's technology vision as well as the principal's training on technology integration.

Although the role of building principals clearly affects the successful integration of technology in instruction, Miranda and Russell (2011) reported that teachers may not use available technology if they do not have adequate technical support. As a result, administrators have an important responsibility to provide ample technology support to buildings. Miranda and Russell concluded that the roles of administrators at the building and district central office levels are crucial to the successful integration of technology in teaching and learning.

Webb (2011) discussed the critical components that school leaders provide in ensuring teacher success and student learning with regard to the integration of technology in the curriculum. Specifically, school leaders provide resources, support instruction, communicate, and are always involved with others in the process. Webb also noted that the entire hierarchy of school leadership from the superintendents to principals and technology leaders affected technology integration. In addition to teacher training, a clear technology message understood by administration can be successful in building support for technology in the community and school board to secure funding, widespread support, and adoption of technology in schools. My study provided findings that are similar to findings of my study as related to administrative support for the integration of technology. These similarities were present with both the concept of leaders providing resources, supporting instruction, communicating, and are being involved in the process. In addition, Webb reported that hierarchy of school leadership from the superintendents to principals and technology leaders affected technology integration. This compares to my findings that included building principal support yet low support from other school

leaders such as the board, superintendent, and other administrators in the higher order of school leaders. Webb's findings regarding the significance of school leaders providing resources, support, and communication and benefiting the integration of technology. Because my study included the hierarchy of school leaders in one school, I could compare my findings to Webb's.

Richardson and McLeod (2011) conducted a qualitative case study to seek answers to their research questions. The topics of the questions were what school technology leadership looked like and the challenges faced by school leaders who are trying to be effective technology leaders, especially in Native American schools. Richardson and McLeod viewed the technology standards as being so important in technology leadership that they used technology standards for school administrators as the conceptual framework for their study. They interviewed nine principals in Native American schools. All participants stated that a strong technology vision that included funding was key to technology leaders' effectiveness in the integration of technology.

Principals who model and promote technology for learning improve technology integration in schools (Richardson & McLeod, 2011). Only one of participant in Richardson and McLeod's (2011) study discussed effectiveness through modeling in both their professional and personal life. Richardson and McLeod (2011) also noted that funding for a diverse body of students was important. Two thirds of their participants believed that their Native American schools had better student access to technology than the local public schools. The study also indicated that most of the training and professional development for technology came from within participants' school district

and that the organization of the training was poor. All the participants reported that they did not receive adequately preparation for their roles as technology leaders in their schools. Participants also noted that they needed improved technology training to diffuse technology throughout their schools more effectively.

Richardson and McLeod (2011) also discussed findings that included barriers to technology leadership that principals experienced. In general, funding was an area of concern for all the principals participating in their study. Some principals reported that staff was not receptive to new technology. Over half of the participants did not have a technology coordinator due to lack of funding. Some principals said that poverty and isolation of the schools were barriers to technology leadership. Other barriers reported were poor facilities and old technology, which were also due to a lack of funding.

The study by Richardson and McLeod (2011) had strong relationships to my study. First, they were both qualitative case studies that involved interviews. The studies also both had school principals as participants. Like my study, Richardson and McLeod used open and axial coding to determine and refine themes in the data, as well as to locate relationships among themes and the relationship of those themes to the conceptual framework. I sought the barriers that may exist in technology innovations in schools, as well as the events that strengthen school leaders in the area of technology. The researchers of both studies cited discussed the roles of school leaders in the process of diffusing technology innovations. Last, the researchers of both studies considered the importance of educational technology standards and their impact on school technology leaders. One area that limited the study by Richardson and McLeod was that they studied

only Native American schools, so the findings may not generalize to public schools with a different school culture.

Similar to Means (2010) and Webb (2011), Ward and Parr (2011) noted that policies in education and scholarly literature on school reform, 21st-century learning, and educational reform initiatives relative to ICT have failed. Ward and Parr noted that on a global level, evidence is lacking that there has been a change in how students learn or that schools have become digitalized despite policies, standards, and teacher education practices. Furthermore, Ward and Parr attributed this lack of successful school reform related to ICT as largely due to a void in the discourse between policies and operations rather than between operational discourse and classroom methods. Ward and Parr noted that policies must provide opportunities for teachers to explore, challenge, and change teaching beliefs and practices to allow for successful school reform related to ICT. It was possible that my participants would raise the issue of the effectiveness of policies on technology integration in their school and whether this is a barrier or a support for technology integration.

Crompton and Keane (2012) performed a qualitative study similar to my study. Their study was on a whole school diffusion of one-to-one computing in one middle school in the United States. This was the only study that I located in my literature search that included a whole school one-to-one diffusion. Crompton and Keane also framed their study using Rogers's theory of diffusion of innovations. They noted that researchers often cited Rogers's theory on diffusion of technology in schools within their studies. In

addition, Crompton and Keane noted that Rogers's theory was the best theory to frame their study because it explains successes and barriers to diffusion of innovations.

Crompton and Keane (2012) discovered that very little research existed on a whole school diffusion of one-to-one computing, which pointed to another gap in the literature and related directly to my whole school study on one-to-one computing. Through interviews with school leaders, Crompton and Keane found that lack of professional development was a barrier to diffusion of one-to-one computing. Crompton and Keane's study was peer reviewed, which added credibility to the findings. Another strength of Crompton and Keane's study as it related to my study was that they used open coding of data to identify themes. In addition, they categorized the themes to identify levels of adopters as outlined in Rogers's theory on diffusion.

In comparison to U.S. schools, Afshari et al. (2010) conducted a study to identify computer use by Iranian high school principals and the relationship of variables related to ICT. Afshari et al. examined computer access, perceptions of ICT, computer skills, and transformational leadership styles and reported that, despite adequate school funding for ICT, the use of technology by principals for instruction and administrative tasks, teaching methods, and student learning was not satisfactory because principals and teachers had not developed positive attitudes about educational technology. Rogers (2003) discussed the importance of attitudes of members and the way attitudes affect levels of adoption of new diffusing innovations. My findings related to those of Afshari in relation to the attitudes of members affecting levels of adoption of new technologies.

Afshari et al. (2010) noted that principals have a significant role in successful ICT integration in teaching and learning. Without the support of principals on ICT, the educational benefits of educational technology integration do not occur (Afshari et al., 2010). Principals must have skills in technology use and must advance a school culture that includes the implementation of technology in the teaching and learning process. According to Rogers (2003), knowledge is one step in the innovation decision process. Principals must have sufficient knowledge of technology use to adopt and encourage educational technology in instruction. School leaders in my study provided information on their roles and the support of technology integration at their school.

Gray, Thomas, and Lewis (2010) conducted a national survey for the National Center for Education Statistics and the U.S. Department of Education. Participants included teachers, district-level administrators, and nonteacher school-level staff. The focus of their study was to determine the availability and use of technology resources, such as school networks, computers, and other technology devices provided for instruction. Gray et al. also collected data on school leadership and support for educational technology. Although Gray et al. explored the use of handheld technology devices for students, they did not study one-to-one computing. Results indicated that an estimated 13% of secondary students and 4% of elementary-level students had technology available to take home. Of the schools reporting, 100% had one or more instructional computers in classrooms, with a computer to student ratio of 3 to 1. Of the computers in the classroom, 91% were for instruction. In addition, 58% reported using

laptop carts, but only 45% of students had access to handheld technology devices. Thirty-nine percent of schools reported having wireless access for the entire building.

Gray et al. (2010) explored to what degree teachers and others assisted with integrating technology based on a major, moderate, and minor degree, which they did not define. Twenty percent of teachers assisted technology integration to a major degree, 47% moderately, and 30% to a minor degree, whereas 14% of administrators reported assisting with technology integration in a major way, 35% moderately, and 39% to a minor degree. Twenty-nine percent of school-level technology staff assisted with technology integration in a major way, 34% moderately, and 22% to a minor degree. These findings were significant and indicated that teachers and other school-level staff were leaders in technology integration, along with school administrators. My study involved exploring classroom educators' views on their roles and levels of support in technology integration at their school and I compared the results with those of Gray et al.

With regard to training, Gray et al. (2010) explored whether participants agreed or disagreed with some items. Seventy percent of responses agreed that teachers receive sufficient training in technology use, yet 64% of teachers indicated they received sufficient training in integrating technology in instruction. Ninety-three percent of responses indicated that teachers want to use technology in classroom instruction. Eighty-two percent agreed that technology integration was a priority to the district.

Although my study was qualitative and Gray et al.'s (2010) study was quantitative, and theirs was national and my study was about one school, I compared and contrasted the data on the degree of technology access for student and staff at the school I

studied. Professional development and technology integration in instruction were other areas examined in both studies.

Historic Teachers' Views of Technology Integration

Shuldman (2004) provided a historical perspective on the significance of the integration of technology in teaching and learning. Shuldman noted that U.S. education had devoted funds for infrastructure and technology hardware, which demonstrated the significance of technology integration in schools as an expectation of society. Shuldman also claimed that the goal of technology integration in education has been a goal at the local, state, and federal levels for decades.

Shuldman (2004) reported that research from the early 1990s identified conditions that enhanced the successful integration of technology in education. The conditions were availability of resources, dissatisfaction with the status quo, existence of knowledge and skills, availability of time, rewards or incentives, participation, commitment, and leadership. From the same time period, barriers that impeded teachers' ability to adopt and integrate technology into their teaching included the lack of time, expertise, access, resources, and support.

In 2004, Shuldman conducted a study with three school superintendents to explore what circumstances were necessary for teachers to integrate technology into classroom teaching practices. Findings indicated that three levels of leaders in schools were necessary to integrate technology: superintendents, administrators such as principals, and technology leaders. A clear vision and message on technology that comes from superintendents and supported by other administration is necessary to gain support,

acceptance, and funds from school boards and others. These findings by Shuldman were important to my study because I also examined the vision statement of the school I studied, what school leaders need to integrate technology, and how school leaders gain the support of others for technology integration. The concept of leadership gaining the support of others relates closely to Rogers's diffusion of innovations theory in the area of the levels of adopters of change. Furthermore, school principals must have direct involvement as leaders for the successful integration of technology. The superintendents expected principals to take the lead on technology in each building to secure teachers work on adoption of technology.

Shuldman (2004) further revealed that teacher development is critical for successful technology integration, but cautioned that this training in isolation is not adequate to guarantee success. The findings clearly indicated that the school superintendents believed "classroom teachers need more opportunities that offer regular contact with the technology itself and with someone who has greater knowledge, experience, and expertise in teaching with technology than they do" (p. 14). The superintendents indicated one barrier to providing this is lack of time.

A second obstacle to technology integration that Shuldman (2004) identified was that the public did not adopt the notion of spending money on training teachers on technology skills. In addition, the public was more willing to spend money on providing technology access to students prior to or at the expense of teachers having access to how to use the technology. The schools districts participating in Shuldman's study had technology resource plans aimed at curriculum skills for students rather than toward

technology integration for teachers. Shuldman's study related well to mine because both studies involved exploring barriers to technology integration, and I compared my results to Shuldman's findings.

It was interesting to compare Shuldman's (2004) findings to my findings on the quantity and quality of technology access for student and staff at the school I studied. Shuldman highlighted findings that indicated a clear technology vision supported by the administrators and school board was necessary to integrate technology in U.S. K-12 schools. I examined the vision statement of the school district participating in my study with participants. The findings of my study did not support Schulman's concept of the importance of a clear vision yet did support the concept of the need for a strong clear long-range plan of technology integration. Participants in my study discussed barriers to technology integration they had experienced. I compared and contrasted the barriers that emerged with those barriers in Shuldman's findings. Findings of my study support the findings of Shuldman relative to barriers in technology integration. This was evident when considering both the importance of professional development and funding for technology integration.

Teachers' Recent Views of Technology Integration

Recent views and findings from studies on technology integration in K-12 U.S. schools show how technology integration in K-12 schools has improved over time. Spires et al. (2012) identified themes from their focus group study with teachers on the topic of technology integration. The themes included (a) need for professional development and administrative support, (b) preparing learners for the future 21st-century workforce, and

(c) tensions in an evolving education system. Teachers reported a desire for support from administration, especially regarding training on emerging technologies. Customized professional development was also a desire of teachers. For example, some participants wanted professional development with regard to technology and the specific content areas taught. I also examined the themes of teacher and administrator views on the necessary components, such as professional development. Spires et al. noted that the integration of technology in U.S. K-12 schools has improved, and I compared data from my study to determine if the current participants felt this was true.

Spires et al.'s (2012) study was relevant to my study, especially when considering the analysis of data. Spires et al. organized their data into themes, which I also did in my analysis. I compared the themes of both studies to determine if there was any consistency between them.

Purcell et al. (2013) surveyed 2,462 middle and high school teachers for a study. More than 90% of teachers surveyed reported that the Internet had a significant impact on locating classroom resources. Nearly 70% of teachers surveyed also stated that the Internet had a major influence on sharing ideas with other teachers as well as communicating with parents, while nearly 60% reported a positive impact on communicating with students. Well over half of the teachers felt the school leaders did well supporting them in technology integration. Furthermore, three fourths of respondents noted the school leaders provided formal training, but an even higher percentage of teachers said they independently found new ways to integrate technology in their classroom.

The teachers surveyed by Purcell et al. (2013) discussed various types of technology use in teaching. Three fourths of respondents reported that, in addition to laptops and desktops, students used mobile devices such as phones, e-readers, and tablets to complete school tasks. The majority of teachers in the study integrated technology in the classroom for uses such as online research, obtaining and submitting assignments, and interactive projects using online discussions and collaboration.

Although teachers reported many positive results regarding technology use, Purcell et al (2013) reported that teachers experienced new challenges with technology integration. For example, 75% of the teachers in Purcell et al.'s study agreed that technology increased the demand of knowledge and skills needed to learn. In addition, nearly half of the teachers expressed that their workload increased with technology use to meet the expectations of their teaching performance.

One concern in the teacher responses in Purcell et al.'s (2013) study was the effect economic status had on technology use for classroom purposes. Although more than half of the teachers reported that all their students had sufficient access to technology at school, only 18% reported the same for students at home. Teachers worried that technology contributed to the gap between children from low-income households and children not from low-income households. Purcell et al. reported that socioeconomic data in the schools affected the level of support teachers received for technology integration in classrooms. For example, teachers whose students had a low economic status reported the students had less formal training on technology and less access to tablets, e-readers, and mobile phones than teachers whose students had a higher socioeconomic status. Well

over half of the teachers working in schools with low-income students noted that lack of resources was a challenge for technology integration for students with a low-income status.

Purcell et al. (2013) reported that when compared to adults in the general U.S. population, teachers possess more confidence and higher skills in the use of technology. When compared to all adults, teachers use the Internet, mobile phones, e-readers, iPads, tablets, and social media more. In addition, teachers use technology to create online websites, journals, and blogs more than other adults do. Nearly 100% of the teachers surveyed for the project reported using the Internet. Most teachers reported they were very confident in their own skills in using new technology.

Purcell et al. (2013) also reported on teacher views of barriers regarding the integration of technology in classrooms, which was relevant to my study, as I sought to determine the barriers to technology integration perceived by my participants. Time constraints were the most frequently reported obstacle to technology integration, followed by the need to teach to assessments. Other barriers included lack of resources and technical support. Only 14% of the teachers surveyed reported resistance by fellow teachers and administrators, and 9% said that their own lack of confidence and training with technology was an obstacle to technology integration in the classroom. When viewed through the lens of socioeconomic status, teachers from areas with more low-income students rated barriers as significantly higher than those from more affluent areas.

Donovan and Green (2010) examined faculty concerns regarding the implementation of one-to-one computing and contended that literature on change

indicated that researching the adoption of innovations using teacher participants with firsthand knowledge provided a greater understanding of the adoption of an innovation. Donovan and Green found that teachers need several opportunities to experience technology integration. Teacher comfort levels are a significant factor in preparing teachers to integrate one-to-one computing in instruction. Donovan and Green found that change agents should give teachers time to discuss technology integration to clear up any misunderstandings. In addition, professional development can address teacher concerns and misunderstandings, so late adopters can become more comfortable with innovations.

Donovan and Green (2010) discussed teacher concerns revealed in their study. One area of concern that participants revealed was that a change in pedagogy would accompany the integration of technology. Teachers in the one-to-one computing initiative also had concerns that the initiative would affect them personally and would affect students. In addition to professional development, many opportunities to experience the new technology, and time for discussion, Donovan and Green recommended addressing both individual and whole-group teacher concerns about one-to-one computing. Furthermore, offering collaboration and support to teachers is important in successful one-to-one computing initiatives.

Spires, Oliver, and Corn (2011) conducted a study to highlight changing dynamics and relationships for teachers and students to handle change such as the implementation of one-to-one computing. Spires et al. noted that the environment affects and is affected by change. Spires et al. noted the learning environment changes in many ways with the implementation of one-to-one computing.

First, Spires et al. (2011) discussed the constancy of immediate access to information with one-to-one implementation within a global environment. Next, personalized learning becomes intense and relevant. Students acquire self-direction, self-monitoring, creativity, and increased curiosity with one-to-one implementation. Another change in the learning environment with one-to-one computing is the option to pace instruction to students' individual needs and learning interests.

A final area of change in a school environment with the implementation of one-to-one computing involves relationships (Spires et al., 2011). Spires et al. (2011) reported change in the relationship between students, between teachers and students, between teachers at the school level, and between teachers and administrators. For example, communication among students changed with one-to-one computing due to the tools available to communicate and use of cooperative projects using one-to-one. In addition, Spires et al. (2011) found an increase in student–teacher interactions with one-to-one computing. Teachers were more available to answer student questions, even when not in the school setting. Some teachers used the technology to help students with homework outside of school hours. Communication between teachers within a school also increased with the use of one-to-one computing. These communications most often focused on professional development and teacher planning. Last, changes occurred in communication between teachers and administrators with one-to-one computing. Spires et al. (2011) claimed that administrators in charge of getting teachers to adopt innovations increased communication in the area of encouragement with the use of one-to-one computing.

Spires et al. (2011) further reported that there are changes in communication between the school and the community with the use of one-to-one computing. For example, teachers and parents more frequently communicated using e-mail. Students and parents both attended orientations on the implementation of one-to-one computing.

Spires et al. (2011) reported other changes to the learning environment due to one-to-one computing. Both teachers and students had more access to information and use of the Internet to research and find information. In addition, students and teachers increased their use of new software for creating projects. Extended projects were more sustainable using one-to-one computing as well.

Johnston (2012) noted that school librarians could play a significant leadership role in schools with regard to integrating technology. However, Johnston also indicated that school librarians do not receive sufficient preparation to fulfill this leadership role. Johnston explored that factors that benefited and hindered school librarians acting as school leaders in technology integration. Johnston's study related closely to my study regarding school librarians' participation. Both studies involved an attempt to obtain the views of school librarians regarding technology integration, including barriers to integration, resources for integration, librarians' roles in integration, and training.

The top item that school librarians identified as a positive influence on their role as technology integration leaders in Johnston's (2012) findings was having a supportive principal who offered encouragement and respected the librarians' role. Support of district-wide administrators was another significant factor in school librarians' successful integration of technology. The librarians rated relationships with teachers as another

significant factor that contributed to successful technology integration. Support, trust, and respect were characteristics that librarians used to describe helpful relationships with teachers. The librarians surveyed also identified unsupportive teachers who are unwilling team players as a barrier to the technology integration process.

Other elements leading to successful technology integration in schools according to Johnston (2012) included leadership opportunities for librarians. Serving on decision-making committees was the example provided. Leading professional development was another opportunity cited, and professional development was another key area rated as enabling technology integration efforts by school librarians. Johnston noted that school librarians needed professional development that would provide them expertise in the area of technology so they could be effective leaders. Other essential skills gained from professional development included gaining knowledge on how to integrate technology into instructional practices. A desire to make a difference for students was another enabler of technology integration that emerged in the Johnston findings.

Johnston (2012) found that the main barriers to the successful integration of technology in schools related to resources. Similar to the findings of Purcell et al. (2013), lack of time was a major concern as a barrier to integration. The lack of adequate equipment and budget cuts for personnel and other resources were significant items rated as barriers to technology integration. Regarding barriers to technology integration, Johnston found that institutional structures such as policies and practices that secure funding were the main barrier to successful technology integration. School librarians noted that the number one barrier to technology integration was intentionally ignoring or

excluding librarians from leadership opportunities. Last, the unclearly defined leadership role of school librarians was a significant barrier to technology integration. In addition to the strengths of Johnston's study mentioned above, the study was also recent, which added to the strength of the findings.

I framed the study using Rogers's (2003) theory on diffusion of innovations, which includes individuals' levels of adopting innovations. Berrett, Murphy, and Sullivan (2012) found that people who help move the technology integration process forward and competent leadership determine the success level of innovation. This concept relates to Rogers's diffusion of innovations theory, which I used to frame the study. Furthermore, the way principals identify their role and their skills in listening to teachers' needs influences the implementation process. Berrett et al. explored how leadership roles and school culture affect technology implementation.

Berrett et al. (2012) noted that technology integration affected school culture. Technology initiatives were frequently top-down plans and could cause friction within the existing school culture. For example, teachers' ability to use technology and their desire to learn new skills were factors in technology integration success. Similar to Hadjithoma-Garstka (2011), Berrett et al. agreed that using teachers' knowledge and listening to the needs of teachers is significant for successful technology integration. Berrett et al. emphasized that administrators need to recognize the role of the teachers as change agents who value technology. Vision, leading by example, teacher support, open dialogue, and shared leadership are essential characteristics in technology integration leadership. Changing into a technology-rich school that has technology integrated into the

curriculum and new instructional strategies happens slowly, and leaders should allow time for it and be supportive of the professional growth of all participants (Berrett et al., 2012). Similar to the study conducted by Berrett et al. (2012), my study involved investigating leadership and the effects of school culture on technology integration. I also examined how school leaders describe aspects of their roles and compared the findings with the findings from this literature review.

Summary

The major sections of the literature review included educational standards on educational technology at the local, state, and national levels. Other areas reviewed were school administrators' preparations for technology integration in classrooms, ICT policies at the national and global levels, and historic information provided as a means of defining the problem for my study and to serve as evidence for the lack of successful integration of one-to-one computing in K-12 schools. Classroom educators, as well as technology technicians, also served as leaders of technology integration in my study. Other literature reviewed included necessary components for the study, such as options for the conceptual framework and the research design.

A gap existed in the literature regarding school leaders', classroom educators', and support staffs' views on the integration of one-to-one computing in K-12 U.S. schools. This gap was particularly evident when using Rogers's (2003) theory of diffusion. My study helped fill the gap in the literature by providing valid and reliable findings on one-to-one computing in a specific school based on school leaders' and classroom educators' views. My study involved exploring views on one-to-one

computing that might assist with identifying common barriers, motivations, visions, or plans. These common themes might benefit the leaders of other school districts who plan to implement one-to-one computing.

Researchers have approached the problem of the lack of one-to-one computing in K-12 U.S. schools in a variety of ways. Studies analyzed for this literature review primarily involved a quantitative approach and included a broad population in U.S. K-12 schools. Most of the studies included in the review had a focus on one-to-one computing or general access students have to technology in U.S. K-12 schools. Other studies provided a historical approach and indicated whether changes have occurred over time in the area of one-to-one computing. The studies included school leaders' and classroom educators' roles and preparation for integrating technology into the curriculum. The data sources in the studies in the literature review included interviews, surveys, and documents or artifacts.

The studies summarized in the literature review had strengths and weaknesses. Although a broad population can be strength, it can also be a weakness. For example, researchers conducting a national study can gather adequate amounts of data and can include findings that are generalizable across settings. Despite this strength, a broad population and geographic setting may not provide the details researchers can gain on a topic with a more limited scope. Similar to the scope of a study, the research tradition can also have strengths and weaknesses. Quantitative studies include factual results, which are a strength, but lack a deep understanding. In contrast, qualitative studies include

fewer facts, but have findings that are rich and broad and provide deep meaning on the topics studied.

Data emerged in my study regarding how school leaders and classroom educators are ready to integrate one-to-one computing in schools. Comparing the findings to the historic views on preparing school leaders showed the ways preparations have changed over time. Rogers's theory of diffusion of innovations helped to explain that diffusion occurs over time. The data in my study pointed to ways preparations for the integration of one-to-one computing have changed recently. Data from interviews and measuring changes with the standards indicated various ways that school leaders and classroom educators are ready to integrate one-to-one computing.

The next chapter includes a discussion on the details of the methodology of my study. The major components in Chapter 3 are the research aspects of ethical considerations and bias, the study population and sampling strategy, measures, and instrumentation. Chapter 3 also includes a description of the data analysis plan, including how the plan directly connects to the research questions.

Chapters 4 and 5 include the analysis of data gathered from the interviews and compared to information obtained in the literature review. I address each research question in detail and support the answers with the findings. Chapter 5 includes a summary of key findings and the impact of my study on positive social change. The study concludes with recommendations based on the findings.

Chapter 3: Research Methodology

Introduction

My purpose in this qualitative case study was to analyze the perceptions of one school leader, three classroom educators, and one technician from one school district regarding the integration of one-to-one computing in one U.S. school when viewed through the lens of Rogers's diffusion of innovations process. The rate of adoption of one-to-one computing in U.S. K-12 schools does not meet the requirements of educational standards or the gap between the use digital technologies inside and outside of school. A research gap existed in previous research on the integration of technology in schools regarding the views of school leaders, classroom educators, and support staff. My study contributes to the existing body of knowledge and helps fill the gap in the literature, and decision makers might use the findings to diffuse one-to-one computing in K-12 U.S. schools. Findings may lead to more research in U.S. K–12 schools that may contribute to the more effective integration of one-to-one computing in K-12 schools.

Exploring the problem included a focus on the experiences or views of school leaders, classroom educators, and technicians regarding their roles in the integration of technology. A gap that existed in previous research on school integration of technology is the views of school leaders, classroom educators, and technicians. The rate of adoption of one-to-one computing in U.S. K-12 schools does not meet the requirements of educational standards or the gap between using digital technologies inside and outside of school. My study helps fill this gap in the literature and contributes information on the rate of adoption of one-to-one computing. Instructional practices in most K-12 U.S.

schools have remained similar for decades, despite recommendations for the integration of educational technology to increase (Means, 2010). Technology is critical in K-12 classrooms to prepare students for technology skills required in future work.

This chapter includes the research design and rationale, the researcher's role, the methodology, and a discussion on trustworthiness. The focus for the majority of this chapter is on methodology, including the selection and recruitment of participants, instrumentation, data collection procedures, and data analysis. More in depth analysis will be included in Chapter 5.

Research Design and Rationale

The overarching questions in my study were as follows:

1. How do school leaders at the district and building levels view the process of integrating one-to-one technology?

2. How do classroom educators and technicians within the school view the process of integrating one-to-one technology?

A qualitative case study method was suitable for answering the research questions because the data collection process involved gathering rich detailed information from individuals within one school district, along with supportive documentation, to compare the themes that emerged in interview responses and conceptual framework of my study. Simon (2006) referred to the case study method as a descriptive method focused on finding solutions to real problems using boundaries set by researchers. Case study research includes questions that refer to the how and what of situations when problems require a rich and descriptive inductive approach. Merriam (2002) indicated that

qualitative research questions demonstrate an open design with the use of questions that ask what or how.

Merriam (2002) emphasized that the goal of qualitative research is to understand how participants view the subject. Furthermore, qualitative research can generate an understanding through communication, and researcher can process data immediately. During data collection, researchers can check with participants for clarity and explore deeper for concentrated meanings and emerging themes. To conduct a qualitative case study, interview questions are open-ended and are how and what questions. These types of questions provide rich narratives that researchers cannot obtain using quantitative methods such as Likert-type scale surveys. Rich narrative responses ensure originality and detailed descriptions. Interview participants can fully express ideas rather than feeling constrained to a researcher's limitations, as can occur in quantitative studies.

Merriam (2002), Yin (2014), and Johnson and Christensen (2004) discussed qualitative analysis as seeking to find patterns that run throughout the data. Based on information in the literature review, patterns that could emerge in my study were strengths and barriers of the diffusion of one-to-one computing, levels of adopters in the population compared to Rogers's (2003) theory, roles of study participants in the diffusion process, and curriculum and instructional changes resulting from the diffusion of one-to-one computing. The qualitative approach provides responses to analyze and organize to determine themes or trends in the responses related to the conceptual framework and research questions. In addition, using a rich and descriptive case study of

one school may be the best way to inform leaders of other individual schools who are attempting to diffuse one-to-one computing initiatives.

Role of Researcher

I had no personal or professional relationships with the participants of my study. In addition, my beliefs are that technology integration has the potential to improve learning. I considered this view during the objective analysis of the data using participants' perspectives to ensure personal bias did not influence the interpretation or results. The study included no incentives as one means of eliminating ethical issues. Furthermore, ethical research assurance exists because I followed my plan that was approved by the institutional review board (IRB) through Walden University before data collection. The plan included statements of informed consent by the participants (see Appendix D). The study took place outside my school system, and therefore, no conflict of interest or power differentials existed. My role was to conduct and transcribe interviews and to collect, analyze, and report data on the topic of one-to-one computing in one high school. Merriam (2002) discussed the researcher as a main instrument used for data collection and analysis in a qualitative study. I conducted my study ethically using prescribed protocols for recruiting and data collection. Detailed descriptions of these protocols appear in the methodology section. In addition, as the researcher in the study, I exhausted all opportunities to saturate data gathered through interviews and documents.

Methodology

Participant Selection

The population for my study consisted of one school leader, one technician, and three classroom educators in one southern Georgia school district. A detailed description of the school district appears in Appendix B. School leaders included one principal, three classroom educators, and computer technician from one school in southern Georgia. Sampling was purposive. Merriam (2002) noted that qualitative research involves exploring the meaning of an event from participants' views. Therefore, it is important to use purposeful sampling to choose the sample that can provide the most meaning. To help ensure richness of findings, depth of understanding, and reliability in the findings, five classroom educators from one school district in southern Georgia participated in the study. Yin (2014) explained that a strength of the case study method is the use of a variety of sources, such as documents, artifacts, and interviews.

The target number of participants for my study was 11. Yin (2014) explained that research needs to be manageable in size. My role in my study was to serve as a researcher, my study had a manageable sample size. Patton (2002) explained that rules for sample size in qualitative studies do not exist. My study was qualitative. Patton further explained that samples in qualitative research depend more on factors such as the purpose and the available time and resources of the researcher. A goal of my study was not to generalize to the population but to analyze the perceptions of school leaders, classroom educators, and technicians regarding the integration of one-to-one computing when viewed through the lens of Rogers's (2003) diffusion of innovations process. My study involved examining the levels of one-to-one computing adopters and the process of

adoption, such as triability and compatibility, compared to Rogers's (2003) theory of diffusion of innovations.

Patton (2002) also noted that in a qualitative study, the sample size seems small only when the researcher's purpose is to generalize findings to the population. In my study, I did attempt to generalize findings to the population of the school district in the study. My purpose was to analyze the rich narratives obtained and organize responses into themes that related to conceptual framework, the literature review, and the research questions for my study. Last, Patton contended that qualitative studies include a focus on small purposeful samples, which can be as small as one individual. The logic of small samples is in the resulting rich data gained in the study. In my study, I obtained rich narrative data. Patton noted that the validity, meaning, and insight gained in qualitative studies pertains more to the richness of data than the sample size in the study (p. 245).

Purposeful sampling involved targeting educators, school leaders, and technicians in only one school district. All school leaders, classroom educators, and technicians of the school under study received invitations to participate via e-mails and phone calls. The letter of consent to participate in an interview indicated that interviews may be audio or video recorded.

Instrumentation

One school leader, three classroom educators, and one technician of one school district in southern Georgia participated in the study. The interview questions were designed with the focus on the theoretical framework, literature review, and research

questions. Interview questions are located in appendix A. The interview questions aligned with the conceptual framework and addressed the research questions:

1. How do school leaders at the district and building levels view the process of integrating one-to-one technology?

2. How do classroom educators and technicians within the school view the process of integrating one-to-one technology?

Interview questions were aligned with the research questions, literature review, and theoretical framework. The questions and major components of the framework were broken down into small concept and questions were designed to target those concepts for data. The two research questions are very broad and aim at collecting data on views of a school administrator, classroom educators, and a technician. Nearly all questions pertain to the views of participants on the topic of one-to-one computing.

In addition to pertaining to broad views, many questions simultaneously related to the theoretical framework. For example, question one asked participants to describe themselves when trying new ideas about technology. This open-ended question allowed participants to expand on a wide range of ideas. The question also was designed to gain data that may indicate participants' attitudes and beliefs, adoption stages, and adopter types because these categories are a significant concept in the theoretical framework. This question also relates to the research questions allowing the participants to openly respond on their experiences and overall views of one-to-one technology. In addition, several questions related to the literature review while also connected to the broad research questions and major concepts of the theory. In the literature review, other

sources reported findings related to the views of administrators, classroom educators, and technicians on one-to-one computing. The literature also reported on findings that relate to the theoretical framework I used. By drafting interview questions in a very open-ended format, it allowed for much richer narrative data and allowed for a connection to the literature review, theoretical framework, and research questions for my study.

Yin (2014) explained that case studies could include a variety of sources. A data collection instrument for my study included a researcher produced interview protocol created based on the research questions and conceptual framework. The list (see Appendix A) identified which interview questions answer each research question and aligned with the conceptual framework. I also kept notes of my observations during the interviews as another data source. According to Merriam (2002) and Johnson and Christensen (2004), the major sources for data collection in qualitative studies are interviews, observations, and documents. Merriam described the saturation of data and resulting findings as occurring when researchers start to find the same information repeatedly with no new information emerging.

Other than case studies using a variety of sources, Yin (2014) explained that researchers in case studies have no control over the data collection environment and cannot control or limit variables. The lack of researcher control existed in my study. Yin further explained that the level of focus for a case study is contemporary, which also occurred in my study, as the participating school had only initiated one-to-one computing in the previous year. My study therefore met all three criteria of a case study put forth by

Yin: the *how* focus of the research questions, lack of control over the data collection environment, and a contemporary focus.

Data Analysis Plan

Analyzing the results of the interviews revealed comparisons and themes among the responses related to the conceptual framework, research questions, and academic standards. The interviews revealed how school leaders at the district and building level viewed the process of integrating one-to-one technology using Rogers's (2003) five phases of the diffusion process as a lens. In addition, the responses from interviews indicated the similarities and differences of the diffusion processes of school districts related to one-to-one computing across the level of adopters and users.

Procedures

After the interviews were complete, they were professionally transcribed. The analysis plan was for responses to be organized by themes using open coding. On the initial reading of responses, I color coded concepts that appeared at least twice as I read all the responses. Each concept that appeared at least twice was highlighted in a different color. After the initial read through was complete and highlighted, I went back through and labeled the various themes that emerged and coded them using A, B, and so on. I then transferred each theme to a chart (see Appendix C) and identified each classroom educator, school leader, and technician and include the themes that emerged. I read each interview one more time while keeping the themes on a list next to me, searched for any of those themes or new ones that I missed, and updated the chart as necessary. Next, I

went through each theme and matched it to the research questions and the conceptual framework. I remained aware that additional or unexpected themes might emerge.

After I made the final count and documented it in the chart, I created a narrative report on the themes discovered in the responses and used explanatory quotes from participants to support the findings. Using axial coding, I analyzed classroom educators' data and then the school leaders' data and identified common themes between them. Last, I analyzed the responses of the technician comparing them with the themes from the classroom educators', and school leaders' interviews. I triangulated the responses from the school leader, and technician with those from the classroom educators, then compared, and contrasted the responses of all participants with the research questions and explanations of how the themes did or did not answer the questions. Finally, I used the themes to provide more detail on the significance of the study and possible recommendations.

Merriam (2002) noted that a researcher should start with one piece of data and look for themes by comparing the data to other data. The researcher should code and then refine these themes or patterns as analysis continues. I organized the interview questions and responses using the types of adopters, as suggested by Rogers (2003). In addition, the analysis included data related to the research questions, conceptual framework, and educational technology standards. A chart displaying the analysis is in Appendix C. If any themes emerge from the data that do not fit Rogers's theory, I may consider using the data by expanding or enhancing Rogers's model. A case study can contribute to the knowledge of the theoretical propositions of a study by confirming or challenging them.

Rogers's (2003) theory of diffusion of innovations served as a guide in my study. I compared participant responses to the types of innovators Rogers set out in his theory of diffusion of innovations. The study involved documenting the responses to determine which participant matched which level of adopter, such as early adopters, innovators, or laggards. A narrative report provided further explanation of the responses and indicated whether all or some levels of adopters existed in the data. Johnson and Christensen (2004) noted the function of theory in research was to create new relationships and make predictions. The conceptual framework informs through a lens that can shape what is under exploration and the questions asked in a qualitative study.

Issues of Trustworthiness

Credibility

Merriam (2002) and Creswell (2003) reported that triangulation, member checking, expert review, and participatory modes of research will ensure internal validity of a study. For credibility, I will ensure internal validity by triangulating data sources from multiple places, which involved comparing the data from one school leader, one technician, and three classroom educators, technology support staff, and a small group of classroom educators.

I was unable to obtain documentation from the school in my study to use as triangulation because the district could not locate the technology plan however, I was able to use member checking for internal validity. Member checking assists in determining accuracy of qualitative findings through taking descriptions and themes back to participants and determining whether participants feel they are accurate. All of the

participants in my study expressed the accuracy of the data and interpretations I had returned to them thus contributing to internal validity of my study. Merriam argued, "Member checks are a common and valid approach to ensuring validity" (pp 26).

In addition to member checks, my study included expert review by the dissertation committee to contribute to the validity of the study. The dissertation committee members are experts in qualitative study planning, implementation, analysis and findings. According to Creswell, validity is viewed as the strength of qualitative research and is used by the researcher, participants, and readers to determine accuracy and credibility (pp. 196-198).

According to Creswell, validity is viewed as the strength of qualitative research and is used by the researcher, participants, and readers to determine accuracy and credibility (pp. 196-198). Merriam (2002) confirmed that the accuracy and credibility of a study is strengthened with the use of expert and peer reviews.

In addition, the presentation of negative or discrepant information that is contrary to identified themes is significant. Creswell (2003) posited that differing perspectives discussing contrasting responses add to the credibility of an account for the reader. To add credibility to my study, all data was included in the findings. Themes were generated using percentages of agreement in responses. The discrepant responses falling outside of the themes were also presented. According to Creswell, validity is viewed as the strength of qualitative research and is used by the researcher, participants, and readers to determine accuracy and credibility (pp. 196-198).

Transferability

I provided rich, thick, and detailed descriptions to ensure external validity and transferability of a study. In addition, transferability was developed with the use of variation in selecting participants. Participants were purposely targeted in the areas of school leaders, classroom educators and technicians for my study. The sample resulted in participants from each area mentioned.

Dependability

Merriam (2002) also informed about the reliability of qualitative studies. Merriam argued that the researcher should seek to determine if the results and the data collected are consistent. Triangulation, peer and expert reviews, and member checks assist the researcher in arriving at valid results and dependability. Merriam stated that like these strategies of determining validity, the strategies can also be implemented to achieve dependability.

Ethical Procedures

As the main instrument used in my study, I followed internal review board approved ethical processes to obtain quality results. I acquired a letter from the school under study allowing me to conduct the study (see Appendix E). Data collection took place with one initial interview per participant conducted by me face-to-face. I sought clarification during the initial interviews. I electronically stored data on a flash drive and a PC that was password protected.

I followed data privacy and security procedures, and I will destroy the data after 5 years. Interviews were audio recorded to ensure accuracy of the data collected. Potential

risks to participants were minimal, as participants remained anonymous by coding their identity. Classroom educators received a code with a letter and a number, such as T1 and T2. School leaders also received codes containing a letter and a number, such as A1 and S1. The study did not involve collecting any private or personal data. Any records or artifacts used for my study were public. All school leaders at the school under study received an invitation to participate in the study. Participants were able to withdraw from the study at any time with no adverse effect.

Merriam (2002) also reported on external validity of qualitative studies. Merriam discussed external validity in terms of ethical research. The ethics of this research have been reported at length earlier. One manner in which this researcher displayed ethical research as protecting the participants with anonymity. Another ethical aspect of my study was the accounting of the researcher's bias. The practices of ethical research adhered to in my study, contribute to external validity.

Summary

My purpose in this qualitative case study was to analyze the perceptions of one school leader, three classroom educators, and one technician regarding the integration of one-to-one computing in one school district when viewed through the lens of Rogers' (2003) diffusion of innovations process. The problem addressed in my study was that the rate of adoption of one-to-one computing in U.S. K-12 schools does not meet the requirements of educational standards. A gap that existed in the literature was the diffusion of technology in K-12 schools according to school leaders and classroom educators. Instructional practices in most K-12 U.S. schools have remained similar for

decades, even though school leaders have recommended the increased integration of educational technology.

My study involved conducting interviews to generate data. The interviews involved five participants from one southern Georgia school district. The study involved coding and organizing data into themes that emerged from the narrative responses to interview questions and triangulating the data using participant groups of school leaders such as administrators, classroom teachers, and nonclassroom staff such as technicians. The study entailed the ethical procedures outlined by the IRB. Participants are at minimal risk and could withdraw from the study at any time. The study did not involve collecting any sensitive data. Participants remained anonymous, and codes served as participant identifiers.

Chapters 4 and 5 include the analysis of data gathered from the survey and interviews and a comparison to the information obtained in the literature review and theoretical framework. I address each research question in detail, supported with the findings. Chapter 5 will include a summary of key findings, recommendations for additional research studies, the impact my study has on positive social change, and recommendations for one-on-one computer integration based on the findings.

Chapter 4: Results

Introduction

My purpose in this qualitative case study was to analyze the perceptions of one school leader, three classroom educators, and one technician from one school district regarding the integration of one-to-one computing when viewed through the lens of Rogers's (2003) diffusion of innovations process. My study involved examining levels of one-to-one computing adopters in one school district using Rogers's theory of diffusion of innovations. My study also involved examining why individuals are at specific levels of adoption of one-to-one computing and how one-to-one computing may affect instruction.

The social problem that I addressed in my study was that the rate of adoption of one-to-one computing in U.S. K-12 schools does not meet the requirements of educational standards or the gap in the use of digital technology inside and outside of school. A research gap that existed in the literature was an examination of the integration of technology in schools based on the views of school leaders and classroom educators.

The research questions served as guides to collect data through interviews with school staff to address the problem of the rate of adoption of one-to-one computing. The overarching questions in my study were as follows:

1. How do school leaders at the district and building levels view the process of integrating one-to-one technology?

2. How do classroom educators and technicians within the school view the process of integrating one-to-one technology?

Chapter 4 includes information related to the organizational condition of the study setting and participant demographics that may be relevant to the study. In addition, the chapter includes a report of the data collected and analyzed, as well as issues of trustworthiness. The chapter also includes a description of the data collection techniques implemented for the study and the findings of the main study.

Setting

My study included five educators from one school district Sunrise School District. Three classroom educators, one principal, and one participated in my study by providing narrative answers to open-ended interview questions. The target number of participants for the study was higher, but I was unable to obtain consent from more participants. The participants all worked in one Georgia school that had access to one-to-one technology.

The Sunrise School District in Georgia has a technology plan with a fundamental belief that educators should not consider technology in isolation; rather educators should address technology within the learning community and integrate it throughout. Sunrise School personnel uphold the recommended essential components of a technology as established by the State of Georgia (U.S. Department of Education), which are as follows:

1. Mission and vision.
2. General introduction/background.
3. Needs assessment/goals.
4. Funding plan.
5. Technology acquisition plan.

6. Access.
7. User support plan.
8. Staff training plan.
9. Program evaluation.
10. E-rate technology plan.

The vision statement of the Sunrise School technology plan is that educators must integrate technology into the curriculum for technology to be effective instructionally. The primary essence of the vision of the Sunrise School is to provide students with access to technology resources to become empowered learners who have the necessary skills for the future. The Sunrise school personnel offer students options of full or hybrid virtual classes. The virtual courses use Odysseyware. The full virtual curriculum occurs at home with parent control. The hybrid choice offers students opportunities to take some courses online and some in the traditional classroom. The virtual program provides students flexibility, self-pacing, and online and traditional classroom learning.

Demographics

The school that participated in my study was a magnet school established in southern Georgia in 2006. The Sunrise School consists of more than 40 teachers and approximately 600 students in Grades 6 through 12. There are specialists teaching in all academic areas. Most teachers at Sunrise School have a certification for teaching gifted students. In addition to completing general high school graduation requirements, all students can focus on a variety of studies. These studies include areas such as prelaw,

preengineering, prenursing, preeducation, and agriculture. The Sunrise School is in a town in southern Georgia with a population of 18,600.

Data Collection

My study included five educators from one school in southern Georgia (Sunrise School District). Three teachers, one principal, and one school technical support staff member provided narrative answers to open-ended interview questions. The target number of participants for the study was higher but I was unable to obtain more participants' consent.

Table 1

Demographics of Participants

Subject	Gender	Race	Specialty	Region	Professional affiliation
T1	Female	White	Education	Southeast	Public school
T2	Female	White	Education	Southeast	Public school
T3	Male	White	Education	Southeast	Public school
A1	Female	White	Educational administration	Southeast	Public school and university
S1	Male	White	Computer technician	Southeast	Public school

The participants provided consent and responded to the 22 open-ended questions for the study, which appear in Appendix A.

Data Collection Process

I completed the IRB forms and received approval from the IRB to conduct the study. The intention was to conduct the study at one school in Florida however, this school district administrator declined to participate, The principal at a school in southern Georgia (Sunrise School) subsequently agreed to participate. I called the principal of the Sunrise School, and she agreed to allow me to conduct my study at her school. She then

put me in contact with one of her teachers, who I corresponded with via e-mail. This teacher provided me with the names and e-mail addresses of potential participants at the site. I then e-mailed each of these individuals and sent consent forms to those who agreed to participate.

The original target sample size was 11 participants. I was able to secure only five participants despite several attempts to include others. I did not seek an additional location because of time and resources constraints. I had already had one location set that fell through and the location in Georgia was my second location. The principal assigned one of her staff members to assist me with my needs. This assigned person and I had multiple contacts regarding participants. She recommended several potential participants originally and she signed consent to participate herself, I made multiple attempts to secure participation of the recommendations. Of those, she and five others agreed to participate and returned signed consent with one principal, four classroom teachers and one technician. I then requested more possible participants to contact and of those provided, none agreed to participate. When I arrived at the school to do the interviews, one of the original classroom educators changed their mind and did not sit down for an interview. This resulted in a final sample size of 5 including one administrator, three classroom educators, and one computer technician. Upon traveling back to my state after the interviews, I again requested more possible participants and of those recommended, but none consented to participate in my study.

According to Mason (2010) and Barnett, Vasileiou, Thorpe, and Young (2015) there are many reasons the sample of a qualitative interview-based study is small yet

adequate. These reasons may include variation of the sample demographics, data providing stakeholders with varied views of participants, demographic samples being similar to the population, participants have diverse characteristics, purposeful sampling was used for possible diversity of views, the type of participants and their views have been excluded or limited from previous research, theoretical generalizations exist in the data, limited time, budget and resources. Mason argued that saturation is beneficial conceptually but gives poor guidance for estimating sample sizes especially prior research and data collection. Saturation has weaknesses. Qualitative samples reflect the purpose of the study and sample size becomes irrelevant, as the quality of data is the measurement of its value.

The sample was diverse by including an administrator, classroom educators, and a technician. With inclusion of a variety of roles people had in this sample, my study contributed to a gap in the literature review. As mentioned in earlier chapters, the literature review was very limited with studies seeking views of school leaders, classroom educators, and technicians on the topic of one-to-one computing. The whole purpose of my study was to get the views of participants with roles of school leaders, classroom educators, and technicians. The sample of my study was small, yet it contributes to the literature merely based on who the sample includes. The sample for my study was purposefully selected and attempted to gain views of a variety of members in the population rather than providing quantitative findings. The data provided by the participants in my study provided ample connection to the literature review, theoretical framework, and research questions of the study.

In addition, there were data and theoretical saturation with the sample of my study in that no new insights come up on the topic or the theory after interviewing the five participants which meets some of the criteria for saturation. Last, there were pragmatic reasons for a small sample size in my study. It was not practical for me to spend further time and resources seeking other possible sights or to continue to attempt to keep asking more participants at the study sight to participate after they declined. The sample provided me with data that answered the research questions, met the purpose of my study, contributed to the literature and filled a gap in the literature, and compared well to the theoretical framework of my study.

I conducted five face-to-face interviews at Sunrise School. There were 22 questions on the interview instrument; however, other probing questions occurred during the interview process. I audio recorded the interviews and used a professional transcriber to transcribe the interview recordings. While typically a researcher may need a confidentiality agreement with the transcriber, I did not because there the data was anonymous. There were no names or other personal identification of participants. The site of the study was not revealed in the audio tapes. Each interview was on its own tape. The tape was labeled with the codes I had created for my study which are T for teacher, A for administrator, and S for technician. The first interview was with a high school science teacher. The second interview was with another high school science teacher. The school computer technician participated in the third interview. The building principal was the fourth participant interviewed, followed by a high school language arts teacher. Each

interview took approximately 45 minutes. The participants received a transcription of their recorded interview via e-mail as part of the transcript checking process.

Data Analysis

This case study included participants of one school leader (principal), three classroom educators, and one technician in one Georgia school. All participants completed face-to-face interviews. The interview questions were open-ended, which led to rich narrative responses. Analysis of the responses resulted in 18 themes. Eight of the themes resulted from 100% agreement among participants, and 10 themes resulted from 80% agreement among responses.

The 18 themes were as follows:

1. New technology has to be useful.
2. Trying technology influences adoption.
3. Technology support in building is high.
4. Access to technology is varied and limited in the school.
5. Technology motivates and engages students.
6. Technology prepares students for the future.
7. School leaders' support for one-to-one is low.
8. Funding is a barrier to one-to-one computing.
9. Technology makes less grading work for teachers.
10. Technology used more in personal lives than at work.
11. Research and trying a technology are my information sources.
12. Peers are my information source.

13. I gave input as a role in our one-to-one technology.

14. Reliability and adaptability of technology influences adoption.

15. No formal professional development is used at the school.

16. Benefit of technology is students can self-pace.

17. A one-size-fits-all technology mandate does not work.

18. Teachers should be asked for input in adoption of technology.

Eighteen themes emerged from the data, and I organized them into three categories: benefits and barriers of one-to-one computing, influences on adoption, and implementation of one-to-one computing.

The participants provided their narrative responses to the questions during audio-recorded face-to-face interviews. A professional transcriber subsequently transcribed the audio-recorded responses into Word documents. Once converted, I coded the data manually. Table 2 contains a summary of the themes categorized by participant.

Table 2

Themes

Theme	T1	T2	T3	A1	S1
New technology has to be useful.	x	x	x	x	x
Trying technology influences adoption.	x	x	x	x	
Technology support in building is high.	x	x	x	x	x
Access to technology is varied and limited.	x	x	x	x	x
Technology motivates and engages students.	x	x	x	x	x
Technology prepares students for the future.	x	x	x	x	x
School leaders' support for one-to-one is low.	x	x	x	x	x
Funding is a barrier to one-to-one computing.	x	x	x	x	x
Technology makes less grading work for teachers.	x	x	x	x	
Technology used more in personal lives.	x		x	x	x
Research and trying a technology are my information sources.		x	x	x	x
Peers are my information source.	x	x	x	x	
I gave input as a role in our one-to-one technology.	x		x	x	x
Reliability and adaptability of technology influences adoption.	x	x	x	x	
No formal professional development is used.	x	x	x	x	
Benefit of technology is students can self-pace.	x	x	x	x	
A one-size-fits-all mandate does not work.	x	x	x	x	
Teachers should be asked for input in adoption of technology.	x	x	x	x	

Note. T1 = Teacher 1; T2 = Teacher 2; T3 = Teacher 3; A1 = Administrator 1; S1 = Computer Technician 1.

Table 3 includes the 18 themes that emerged from the data analysis. The themes are organized into the three categories.

Table 3

Theme Categories

Benefits and barriers	Influences on adoption	Implementation
Technology support in building is high	Reliability and adaptability of technology	I gave input as a role in our one-to-one technology
Access to technology is limited in the school	Peers are my information source	No formal professional development is used at the school
Technology motivates and engages students	Research and trying a technology are information sources	A one-size-fits-all technology mandate does not work
Technology prepares students for the future	Technology is used more in personal lives	Teachers should be asked for input in adoption of technology
School leaders' support for one-to-one is low	Trying technology influences adoption	
Funding is a barrier to one-to-one computing	New technology has to be useful	
Technology makes less grading work for teachers		
Students can self-pace		

The school had a variety of one-to-one devices and had a blended approach. Classroom educators used a BYOD approach in which students and staff use cell phones, tablets, or laptops that they personally owned for one-to-one access at school. The school also had class sets of Chromebooks purchased by the school district. Some classes had Chomebooks in the room every day with full access, and some Chromebooks were on carts, so the teachers could provide one-to-one technology. Two classrooms had a set of Netbooks that remain in the classroom 100% of the day. In addition, all classrooms have access to a computer lab.

Question 1 asked participants to describe themselves when they consider adopting new technology. One hundred percent of participants said technology had to be useful.

T3 stated, “So I’ll evaluate the use of technology and decide if it’s useful to me or not. And more often than not, I’ll probably discard it, but I’m always looking to see if it’s useful.” S1 stated, “I like to do the research on it, you know, know how it works before I try it and see what is working or what’s not working. See if it’s reliable.” These two statements represented similar types of responses from the participants that indicated their processes for evaluating a new technology. All participants described themselves as needing technology to be useful when considering its adoption.

The focus of Question 3 was participants’ reaction when hearing of a new technology. One hundred percent of participants responded that trying it was important to them. T1 said, “I’ll at least try them out and then see if it’s something I want to adopt.” Again, participants indicated their interest in trying out something new.

The focus of Question 12 was what had strengthened participants’ technology skills, and 100% of participants said trying the technology. A1 replied, “Curiosity and just a willing spirit.” This example demonstrates how the participants found the idea of trying something helped them gain skills and knowledge.

The topic of Question 13 was whether participants felt there was adequate support for one-to-one technology from school leadership, and 100% indicated that support was low. A1 stated, “So the administration we have now—it’s not as easy to work with as it used to be. We’re not always on the cutting edge of getting stuff.” All the participants commented that more support for one-to-one technology was desirable. The teachers and technician stated that the building-level administrator was supportive of their needs regarding technology, although they noted the upper central administration could be more

supportive. Participants commented that they would like to have the upper administration such as the superintendents and technology director make funding technology a greater priority. In addition, participants wanted the upper administration to include teachers more often in the decision making regarding which hardware would be more functional for instruction, and they noted that this should not be just one type of technology, as different teachers have different needs.

The focus of Question 14 was the appropriate level of technology support in the school building. One hundred percent of participants said they were thrilled with their building technology support and availability. In general, all participants experienced a fast and efficient response from the building technician. School personnel have a system in place to send a request electronically to the technician, but he will also reply quickly to a phone call or face-to-face request to resolve problems quickly. T1 said, "Now we have our own guy. He's here, he's awesome. It is fabulous." All participants made it clear that the technician and his skills are very much appreciated and necessary for participants to use one-to-one technology successfully.

The focus of Question 15 was whether participants could observe a connection between use of one-to-one technology and student engagement or motivation. One hundred percent of participants said yes, there was a strong connection in motivation especially. T2 said, "It engages the kids more. And it's all about some of these things engaging and motivating them." All participants indicated that one-to-one technology highly engages and motivates learners. A variety of technology stands out for teacher as far as engaging students. Some participants believed the Chromebooks were the most

motivating, whereas one participant felt the Netbooks were motivating. Four participants also used BYOD in classrooms, which also engaged and motivated students. One reason for this is that students can move at their own pace frequently and can repeat online assessments to improve their work. They gain immediate feedback from the technology in place, which motivate the learners as well. Regardless of the type of devices used, the participants feel that, in general, one-to-one technology is engaging and motivates learners.

The focus of Question 16 was whether participants felt the use of one-to-one technology at the school was preparing students for the future and 100% said yes. Two of the teachers described feedback they received from students regarding higher education and technology:

> I've gotten many comments from students that have gone on afterwards and they express like, "We use Google, we use Google drive, we use Turn It In, we use lots of stuff," but their comment that comes back that leads to this workplace integration and college success and everything else is its ability to navigate. So, I have 10 different places that I need to go that are technology to their websites or their services and there are 10 different ones and they're complete. It could be completely 10 different ones in college or in a workplace environment, there can be 10 different ones, but the ability to just have that savvy that I can figure this out because I did it before. I figured it out this other place so I can probably use some of that to kind of steamroll into figuring this out too.

When asked if one-to-one technology is preparing the students for the future, T1 said,

> I don't know necessarily about the workplace, but I have gotten feedback on colleges. Because I teach juniors and seniors anatomy as well, and I've had some tell me that they feel prepared when they go to college because even though they might have a course in the lecture phase, but then they have a component that's online and they're comfortable with it and they know what to do, and that leads to them being successful.

Participants had received feedback from students and others that one-to-one technology use in school prepares students for higher education and work. The school in my study had a blended model of one-to-one technology, including personal devices, Chromebooks, desktops, and Netbooks. T1 had a full set of Chromebooks accessible for students 100% of each day and used BYOD. Students learn skills such as online research, discussion, and assessments, which transfer to using other devices and in future classrooms in college.

Question 19 inquired about the benefits of one-to-one technology for students. One hundred percent of the participants stated the technology engages students and it is highly motivating for the students. T2 said, "Students are engaged and it really helps clarify some things that you do." Participants provided examples of how students benefit form the use of one-to-one technology. T2 indicated that there are fewer discipline problems in class because the students engage with learning on the devices. Participant T2 noted that the high amount of engagement and motivation the students gain from one-to-one technology is the most beneficial aspect of one-to-one technology in her classroom.

Question 20 asked participants what barriers existed in obtaining or using one-to-one technology at the school, and 100% responded that it was funding. T3 said,

> Money is one and the other one is the—the one I mentioned earlier: that if it can't be updated. I don't want those to not work now without a way to update them to the newest versions. But there should be a way to keep using what you have, and what you have created should continue to flow, and you should never have to start over from scratch.

S1 said,

> We've really upgraded our infrastructure to handle the additional workload. That's what we see where we're going. So, we kind of attack it from that standpoint versus get all the Chromebooks and then we have no bandwidth. I mean, we're going to that direction. It just takes time and money. So money and infrastructure, but money is the hugest.

The lack of funding for one-to-one technology is an obstacle in adoption, as noted by all the participants.

The focus of Question 21 was determining what advice participants might give to others considering and planning to adopt one-to-one technology at school. One hundred percent of participants said that trying technology was an important factor in deciding what to obtain. T3 said,

> Technology, like I had mentioned before, you know, is not a one size fits all. And if you approach it with the, we're all going to do this technology, whatever it is, prepare for a third of the staff to get on board with it and a third to resist actively

> and a third to be indifferent with it. Unless you give people time to practice with it, you're not going to get completed just like anything.

The ability to try a new technology prior to purchase increases the likelihood that more individuals will adopt the technology.

The school principal approached this answer from the viewpoint of managing her teachers. When asked about advice for others considering adopting one-to-one technology, A1 said,

> So don't try to pick something and make everybody do it. Encourage people to try stuff. And when they try stuff, then have a vehicle to share that stuff. I'm a cheerleader. I'm the flipping cheerleader. I don't mandate anything in here. I just get out of the way and let them do it. That would be my advice. Don't try to mandate this thing or that way. It doesn't work for everybody. When you start mandating that we all look alike and be alike and be Stepford teachers, it's not going to work. We need to give smart people the choice to do some different things, that, and you stand on the side and cheerlead it.

Several participants commented that individuals need the time to consider what technology may best suit their needs, and therefore, mandating that everyone use the same hardware is not an approach that will raise the likelihood of individual adoption.

The instructional needs of a science teacher are different from an English teacher, according to T2. For example, she commented that in science, she uses the one-to-one technology less than those who teach English because she has labs to perform with students and the labs require working with materials outside of one-to-one technology.

Despite individual teachers' needs for technology in instruction, the teachers noted that everyone needs to be able to try a technology, be comfortable with that technology, and determine if it is the best device for their needs, and therefore, it is not reasonable to provide one particular type of device to all teachers.

The focus of Question 3 was what types of things might change participants' attitude about adopting a new technology. Eighty percent of the participants responded that if the technology was flexible and adaptable in meeting their needs, they would be more likely to adopt it. T3 said,

> If I figured out how to use it one way and then it's updated, as long as it works. Like, for example, like software. If there's a file you did in Microsoft Word, it's still going to open in the new version. And especially because technology has changed, I want it to at least be useable and possibly modifiable.

Participant S1 did not indicate that the technology has to be adaptable. S1 did not use technology for instruction in the school; rather, S1 maintains the technology. I did not specifically ask S1 if the technology should be adaptable because I was letting the responses come from them rather than trying to gain full agreement among participants.

The focus of Question 4 was where participants were most likely to get their information about new technology. Eighty percent said from peers, doing research, observing the technology in use, and trying the technology. For example, A1 stated, "I'm not going to go online and check out that. I like to talk to people who have used it." Participant S1 responded, "I like to do the research on it, you know, know to see how it works before I try to see what is working or what's not working." T1 responded

differently from 80% of participants. T1 said, “I will say that things come up on—it's weird, but the Facebook feed, to try this in your classroom. Because, you know, they know you and they know what you do. So word of mouth and social media.” Most participants gain their information about new technology from colleagues, research, and observing the technology in use.

The focus of Question 5 was whether participants used technology more in their personal lives or work lives, and 80% said personal lives. TI said, “Okay, I would say that I added it at work because I’m comfortable with it in my personal life. But it’s made life easier here at work. I mean, I don’t think if I was comfortable with it in my personal life that I would be as ambitious to use it in my classroom.” Participant T2 described herself as old-fashioned. T2 stated, “I am more apt to use it at work. And in my third year of teaching, my realization that year is whatever engages the kids.” Most of the participants used technology more in their personal lives than at work.

The focus of Question 7 was determining the role participants had in adopting new technology at their school. Of significance was that 80% responded that they gave input on new technology to decision makers. S1 stated,

> So, I have a boss. He’s the technology director at the Board Office, and he gets everything. Like we get a couple pieces of hardware and he will say, “Hey, come check this out,” you know. What do you think about this versus that one?” And he values our opinions and then he makes decisions based on that. And then they go out and purchase.

T2 stated, “I did not have a role but I would be willing to be on a committee or something if I was asked to be.” A1 said, “I was on the committee that wrote the grant.” All except one participant had a role in the process of adopting one-to-one technology at the school.

The focus of Question 8 was participants’ involvement in the planning stages. Eighty percent of participants said they gave input and opinions on technology to administrators. T2 stated, “I feel like I'm not knowledgeable enough to know what to do.” Although T2 was willing to play a role in promoting the addition of one-to-one technology, she wanted to increase her own skills at using the technology first.

The focus of Question 11 was professional development at the school. Eighty percent of participants said there was no professional development. One participant, T2, stated,

> I detest it. I would so much rather try it. It’s like, “Let me go figure it out.” And another problem with that, also, when we’re sitting at a meeting, is there’s a group of us that would either already know about it or will figure it out if we can go work by ourselves. And then we have the group that need their hand held and are very resistant for a variety of reasons.

A1 said, “We've almost found if we embed our professional development, it does a better job. If somebody has something they want to go see, then we do everything we can to get them there to see it.” Most of the participants preferred peer support and their own practices of research and trying technology to organized professional development for the group in the work setting.

The focus of Question 17 was how participants' leadership had influenced the integration of technology, and, as with Questions 7 and 8, 80% of participants responded that they gave their input and opinions. T2 stated, "I feel like I'm not knowledgeable enough to know what to do. I would like to know why the Chromebooks are the best choice." Most participants were grateful that they were able to provide input in the decisions to adopt one-to-one technology.

The focus of Question 20 was the benefits of one-to-one technology for students. Eighty percent of the respondents stated the technology allows students to self-pace their work. T2 said,

> That helps them when they get to college and they're taking all virtual classes, they're taking online stuff, so they technically learn to do it. They are engaged and it really helps clarify some things that you do. They really like taking quizzes online. I can't grade them fast enough. Some teachers can, but I can't. I was not able to return it in time for them to actually use it to study, but using stuff online like that allows us to grade it on the program. They can retake quizzes and go as fast as they want to.

T1 stated, "We don't have to wait on the slowest writer in the class. They can work at their own pace. We just have to encourage them to have a pace that is doable and not get behind, that doesn't help." S1 maintained technology at the school and did not instruct students. S1 said, "It's fast and you can get information about anything, so it's good for research." Engagement, familiarity of technology, and self-pacing were benefits that participants saw for students using one-to-one technology.

The focus of Question 21 was determining what advice participants might give to others considering and planning to adopt one-to-one technology at school. Eighty percent of the participants mentioned that a one-size-fits-all policy is not useful; rather, teachers should give their opinions on what works best for them and that just mandating that everyone use the same technology is not useful. S1 said, “So don’t try to pick something and make everybody do it. Encourage people to try stuff.” A1 added,

> So, if there’s an instructional technology person that has classes once a quarter, whatever, and says, “Hey, here’s how we use the software. This is what you could do with the type of software,” I think it would make your teachers more at ease and want to use the technology more.

T3 said,

> Technology, like I had mentioned before, you know, is not a one size fits all. And if you approach it with the, “we’re all going to do this technology, whatever it is,” prepare for a third of the staff to get on board with it and a third to resist actively, and a third to be indifferent with it.

T2 responded with, “I would say to gauge the teachers, somehow survey [them] to know if this is something they're willing to do because you can’t force teachers to use technology. I mean, well, you can, but it’s not going to work.” S1 did not mention mandating that all teachers use the technology. S1 said, “I wouldn’t give advice, but I would say this is what we did.” Most participants noted that mandating the choice of hardware is not an effective way to promote a technology.

Five questions resulted in no significant pattern in responses or emerging themes, as shown in Table 4. These questions resulted in 67% or less agreement.

Table 4

No Themes

Question	T1	T2	T3	A1	S1
2. Describe yourself with new practices.	Hesitant	Has to be useful/reliable	Has to be useful/reliable	Cutting edge/ very involved	Has to be useful
6. What is the attitude of most teachers in your school with a new technology?	Varied: 1/3 no use, 1/3 some use, 1/3 full use	Generational	Varied; some resistance: 50%-50%	Very open; 100% have a website, but not all use it for instruction	Some resistance; 60% receptive
9. How much access there was to one-to-one at the school.	Varied	Limited for most	Varied	Okay, need more	Improving
10. How much technology do you use at work in a typical day?	Near 100%	50%	Near 100%	75%	0%
18. What experiences prepared you for implementing one-to-one technology?	Seeing my husband use it	Don’t know	Trying it	Personal use of technology	Research

The focus of Question 2 was obtaining participants’ descriptions of themselves when considering new instructional practices. Participants T2, T3, and S1 said that the practice had to be useful. T1 stated, “Um, I don't know. I just feel hesitant.” When describing herself regarding new instructional practices, A1 said, “I’m going to be on the

cutting edge of that." Although three participants described themselves as needing new instructional practices to be useful, other participants did not see themselves in the same way. One participant was hesitant and resistant to new practices and one was in the forefront of instructional change decisions.

The focus of Question 6 was the attitude of most teachers at the school with new technology. T1 said, "In general, I think it's generational and comfort levels.
The newer and younger teachers embrace it more than others do. I'd say it's about 1/3 use it often, 1/3 use it some, and 1/3 are resistant." A1 described attitudes as "very open, with 100% having a website but not all use it for instruction." Perceptions of peers' attitudes on technology use varied among the participants.

The focus of Question 9 was the amount of one-to-one access at the school. Answers varied, which resulted in no theme. T2 said, "It's limited. Two classrooms initially were equipped. They have access with Chromebooks. Everybody else, we don't have a computer lab to go to anymore. When we did, it wasn't very reliable." When asked about the level of access, S1 said, "It's getting better. We're getting more Chromebooks for the Chrome cart. You know, we would like to see one more." The responses regarding the amount of access to technology at the school varied widely.

The focus of Question 10 was how much of their typical day involved using technology. T1 and T3 said nearly 100% of the day. T2 used technology about 50% of her workday, and A1 said she used it 75% of her typical day. S1 said, "I don't—you know, working for a school system, I don't actually use a lot of it, I just maintain it." The responses indicated that the use of technology varied widely from 0% to 100% of the day.

The focus of Question 18 was what experiences prepared participants to implement one-to-one technology. S1 said, “Well, willingness to learn. For one, I find it interesting. It became a hobby. Any time you have a hobby, you enjoy doing it. So you tend to research, look up things.” T1 stated, “Seeing my husband [a teacher] use it.” T2 didn’t know which experiences influenced her. T3 said just trying technology prepared him. Last, A1 said that using technology in her personal life is what mostly prepared her to implement one-to-one at work.

Rogers’s (2003) theory of diffusion of innovations served to frame my study. Rogers’s theory had categories to categorize themes in the study. Rogers discussed the properties of innovations as follows:

1. Compatibility is the extent to which an innovation is consistent with the values, experiences, and needs of possible adopters.
2. Complexity is the extent to which an innovation is difficult to understand.
3. Triability is the extent a person may experiment with an innovation.
4. Observability is how visible an innovation is to others (p. 266).

The values of individuals affect the pace of adopting innovations. Rogers noted that how quickly individuals adopt change relates to whether they value a new approach compared to their existing approach.

These properties of compatibility, complexity, triability, and observability received consideration in the categorization during the analysis of themes that emerged from the study. Themes that emerged relating to compatibility included technology needing to be useful, reliable, and adaptable. Participants repeatedly stated throughout the

interviews how important it was to them that they could try a new technology, that the technology works well consistently, and that the technology is adaptable to meet their current needs. Participants mentioned these desirable characteristics of technology, even on questions that did not pertain to the topic of compatibility. For example, T3 stated, "It's got to be functional for a teacher to make it worthwhile." Compatibility was one of the most significant components of a new technology when participants were considering adoption.

In addition, technology motivates students, benefits students because they can self-pace the work, and prepares students for the future, according to the interview responses. Participants noted that technology also benefits teachers, as it results in less grading time. T1 said, "For me, it's taken away a lot of grading hours because the quizzes are online, are graded instantaneously. So I have much more time after school back to myself."

The theme that participants gave their input and opinions in determining which one-to-one technology to obtain also fit under compatibility, as did the theme that a one-size-fits-all mandate to use a specific technology will not work. Rogers (2003) contended that an innovation must be consistent with the values, experiences, and needs of possible adopters. The above themes that emerged from the responses all emphasized the significance to participants that a new technology be consistent with their values, experiences, and needs for adopting the technology to receive consideration.

Complexity is the extent to which an innovation is hard to understand (Rogers, 2003). A theme that emerged from interviews and fit into the category of complexity was

that trying and observing a technology is helpful in deciding if it is useful. In addition, the participants stated that ease of use of a new technology is a factor in deciding whether to adopt. T2 stated, “At this point in my teaching career, in teaching 15 years, if it is something that in a very concrete easy way will help, I'm willing to adopt it.” In addition, the idea that adoption levels are so varied and generational in the setting, as indicated in interviews, may point to the complexity of the innovation as an issue in adoption levels. The theme of the lack of formal professional development in the setting also falls into the category of the complexity of the technology, as this lack of training may prevent individuals with less technology experience from understanding the new technology.

Rogers (2003) noted that triability and observability of innovations are factors in the rate of adoption by individuals. One hundred percent of participants stated that trying a new technology influenced their willingness to adopt the technology, and 80% stated that trying a new technology was a major source of their information about new technology. Observing others use a new technology did not emerge as a theme in determining the influences and rates of adoption.

Rogers (2003) indicated that individuals have varied levels of willingness to adopt innovations. I used these stages in the diffusion process to categorize some data collected in my study. Rogers categorized individuals into the following five categories of individual innovativeness:

- Innovators: venturesome, educated, multiple information sources
- Early adopters: social leaders, popular, educated
- Early majority: deliberate, many informal social contacts

- Late majority: skeptical, traditional, lower socioeconomic status
- Laggards: neighbors and friends are main information sources, fear of debt

Rogers (2003) outlined three specific stages: adopting an innovation, diffusing innovations, and levels of individuals' willingness to adopt an innovation. In my study, the interview questions specifically targeted these stages as they applied to the school and individuals under study. The stages related to the participants in my study. T3 was an early adopter. T3 had a high level of involvement in the initial stages of planning to obtain new technology for use in the classroom. T3 had spent time researching, trying, and observing new technology to make well-informed decisions about what hardware would be the most beneficial. T3 gave a lot of input to school leaders and assisted in grant writing to be able to purchase his preferred hardware. In addition, T3 spent time supporting peers in his school and teaching them how to use specific technology for instruction. T3 said,

> I'm willing to adapt some technology, but there's a principle. If I figured out how to use it one way and then it's updated, as long as it works. Like, for example, like software. If there's a file you did in Microsoft Word, it's still going to open in the new version. That will be fine. And especially because technology has changed, I want it to at least be useable and possibly modifiable. Yeah, absolutely. So that would, as long as that is true, I'm willing to work with it.

One participant was an early adopter due to heavier involvement in the initial stages of the adoption process and ongoing involvement following adoption of one-to-one technology.

Three participants (S1, A1, and T1) were early majority adopters under Rogers's (2003) levels of adopters. This level of adopter is deliberate and uses social contacts to adopt innovations (Rogers, 2003). All three participants had some level of involvement in the planning stages of obtaining one-to-one technology at the school. All three gave input to school leaders regarding the hardware they preferred to use in instruction. T1 said, "Sometimes they pick certain people, staff that are interested or to guide them. They respected our opinions because we are users." Most participants demonstrated they were early majority adopters in the process of adopting one-to-one technology at the school.

A1 was an early majority adopter. A1 stated, "I'm not about trying to flip every classroom in this building but what's happening, when they see it working, somebody else wants to. And then somebody else wants to." A1 also said,

> I'm more of a wait-and-see person. I like to wait and see what's happening. I'm not going to be on the cutting edge, just because it's new. I'd rather wait and see how it—I never, for example, just when they change a body line on a new car, I'm not going to be the first one to buy that one. I've got to wait and get the bugs out. So, I'm willing to wait and see the bugs get out of it. Then, I'm very interested. I mean, I keep trying the classes online myself at the university. I'm into it, even though I'm an old head. This old dog is learning.

But when it came to new instructional practices, A1 stated,

> I'm going to be on the cutting edge of that. If there's a new standard, I'm going to be one of the ones that's scheduled to go through and look at some of the test items. We helped do the roll out of one of my friends working in South Georgia.

> When it comes to the curriculum, I want to be up front. I want to know what's going on. I want to know—I want to help with it. If it is so new and that's going to be used in the classrooms, I want to know about it. Even though a lot of that is flavor-of-the-month. But, if we're going to have to use it, I'll be on the front row, front row seat.

Even though A1 was an early adopter of instructional practices, A1 was an early majority adopter in the process of one-to-one technology implementation.

S1 was also an early majority adopter. S1 said,

> I like to do the research on it, you know, know to see how it works before I try it. I like to see what is working or what's not working. I love buying technology. I'm eager to find technology. I started years ago, building my own computers. So as new technology comes out, the faster they are, the more they can do, you know, I'm—I say, "Hey, I want to try that. Let's do that." You know, it's better, faster. So I've just been doing it so long so that anytime new technology comes out, faster processor or whatever, I say, "Hey, let's get that."

S1 described himself as eager and excited to adopt new technology, which put him in Rogers's (2003) category of an early majority adopter.

Evidence of Trustworthiness

Merriam (2002) and Creswell (2003) reported that triangulation, member checking, expert review, and participatory modes of research can ensure internal validity of a study. For credibility, I ensured internal validity by triangulating data sources from multiple places, which involved comparing the data from one school leader, one

technician, and three classroom educators, technology support staff, and a small group of classroom educators.

Transferability was provided with rich, thick, and detailed descriptions to ensure external validity and transferability of a study. In addition, transferability was developed with the use of variation in selecting participants. Participants were purposely targeted in the areas of school leaders, classroom educators and technicians for my study. The sample resulted in participants from each area mentioned.

I used triangulation, peer review, and member checks to ensure dependability in my study. Merriam (2002) argued that the researcher should seek to determine if the results and the data collected are consistent. Triangulation, peer and expert reviews, and member checks assist the researcher in arriving at valid results and dependability. Merriam stated that like these strategies of determining validity, the strategies can also be implemented to achieve dependability.

Merriam (2002) noted that a valuable qualitative study is one accomplished ethically. The reliability and validity of a study are partially dependent on ethical research.

Results

Many interview items resulting in themes related to Research Question 1. The first theme that relates is that the users should be able to try new technology, observe technology, and research technology prior to deciding to adopt it for instruction. Along with these three items, the school leader believed strongly that a mandate for all staff to

use one type of one-to-one technology would not succeed. The administrator explained her philosophy that a one-size-fits-all approach would not work. She noted that her school uses a blended or hybrid approach toward one-to-one technology. For example, the school has a BYOD policy for students and staff, and many students and educators use their personal devices in courses. A computer lab supported with staff provides full classes or individuals to access technology. In addition, there are Chromebook carts available for teachers to share, as well as some Chromebook carts that remain in classrooms 100% of the time. Last, the administration indicated that teachers should be able to provide input to administration about what hardware works best for their instructional purposes to support the successful implementation of one-to-one technology.

I was unable to gain the participation of the librarian in an interview. The teachers and technician had 80% to 100% consensus on nine items in the interview that related to Research Question 2. All participants stated that the building technician maintained and supported teachers with one-to-one technology with high-quality service. All participants agreed that maintaining technology is essential for successful integration in instruction relating to the research question. All the teachers and technicians agreed that the technology chosen for a school must be useful for instruction and that they individually use research as a way to gain information about one-to-one technology that may best meet their needs. One hundred percent also said that they use technology more in their personal lives than at work. One hundred percent of the teachers noted that trying technology is an important part of the integration process, as is having peers for support,

which also addressed Research Question 2, as the means of learning about technology is using and trying technology, which matches the usefulness discussed above.

Another commonality among the technician and peers related to the benefit of technology for students. One of the benefits is that technology is engaging and motivating for students, and the other benefit is that students can self-pace their work and assessments. All teachers noted the significance of motivation for students. Furthermore, all of these participants stated that one-to-one technology prepares students for college and the workforce. The benefits of one-to-one technology are an important part of the personal process of adopting and integrating one-to-one technology, which relates to the answer of the second research question. Student achievement was a priority factor in participants' decision making. Preparing students for the future in education and work also addresses the educational standards discussed in the problem statement, as this preparation helps to meet the requirements of standards that are currently unmet.

The teachers and technician also all agreed that access in the school was still a limitation and that funding was a barrier in the process of integrating one-to-one technology. All the participants wanted an increase in access to hardware as well as the infrastructure required to support it. As funding is the main barrier to increasing access, funding relates to the research question. The participants noted that school district budgets should have more emphasis and priority on funding technology at the school, which is a part of the process of integration. In addition, all the participants said that they provided input into the decision-making process of the integration, which demonstrated how they believe the process should proceed.

The administrator also noted that any training in the school for one-to-one technology should take place in house with existing staff members who use the one-to-one technology. Some of the staff were more advanced in their lessons using technology and more skilled with technology use in general. She relied on some people in the school to support her and other users who were not as capable or well versed in the use of one-to-one technology. She also noted she would approve requests for teachers to attend outside professional development on one-to-one technology.

Last, the administrator stated her belief that students and teachers benefit from the use of one-to-one technology. She also taught two advanced courses and uses one-to-one technology in those classes. She noted technology use prepares students for college and the workforce. She also indicated that one-to-one technology highly motivates and engages students because students can work at their own pace. Benefits also exist for teachers. For example, the administrator noted that teachers are able to save time grading work because a lot of the scoring takes place automatically with online programs, including assessments. The initial setup of technology instruction is time consuming, but it saves time in the end in day-to-day lesson planning.

The building administrator presented ideas that may contribute to a solution to the problem in my study. The problem addressed was that the rate of adoption of one-to-one computing in U.S. K-12 schools does not meet the requirements of educational standards or fill the gap in the use of digital technology inside and outside of school. One example of this solution is the belief in using a hybrid technology system in the school, which includes students' use of personal devices for learning and teachers' use of personal

devices for teaching. The school uses a BYOD program to provide more access to teaching and learning. The BYOD concept increases access because students and educators have more devices. Four participants T1, T3, A1, and S1 stated that they use technology more in their personal lives than at work, so the BYOD policy contributes to closing the gap on the rate of adoption discussed in the problem statement. It also closes the gap on technology use occurring more outside of school, as stated in the problem of my study.

Themes emerged from the data that provide information through which to answer the research questions. One theme that emerged was that support for one-to-one technology with the current district-level administration is low but the support is high for one-to-one technology at the building administration level. Although the theme emerged that district administrators' support is low, there was no further information to explain why it is low. Participants had this view because access to one-to-one technology is low at the school. Participants indicated they would like to see more one-to-one technology provided at the school in the form of tablets for students. Participants also would like the computers for teachers upgraded. The data did not explain the low support of the district administration; however, barriers may be causing the perception of low support. All participants stated that funding was the main barrier to obtaining more one-to-one technology. If the administration cannot obtain funding for the technology, it will be unable to provide the technology, even if the administration would like to add technology and improve the infrastructure.

Participants stated that building-level support from the administrator for one-to-one technology is high. Teachers expressed that the administrator provides them with technology and related training whenever possible. The administrator demonstrated support for teachers to use technology freely in instruction. The administrator in the building also taught two classes and used technology for instruction in both. The building administrator allowed the increased use of one-to-one technology by supporting a BYOD blended design that includes use of personal devices and school devices by students and teachers for instruction and learning. The administrator also trusted her teachers to use one-on-one technology in a way that is most useful to teaching and learning. The administrator also engages with teachers in support sessions regarding technology use. Finally, the building administrator helped write the grant to obtain the Chromebooks and carts that allowed one-to-one access, which demonstrated her support of technology

Rogers (2003) also discussed the late majority adopters who tend to be skeptical and traditional and have a lower socioeconomic status. T2 was a late majority adopter. T2 said,

> I'm a bit old fashioned. We go on trips the last summers, traveling 2 weeks, we just drive out West about five, six thousand miles, wherever we want to go. Occasionally, I'll pull out my phone and use the GPS. But it's just not the same. I want to see where I am and where I'm going. I like to use a paper map.

In addition, T2 stated,

> My kid is seven—seven and a half—and she has a lot of friends that either have phones or it's mostly like hand-me-downs, they have the tablet, iPad. She has no

> technology of her own. She has access to stuff, but this has forced her to play in her room and use her imagination. She reads, and she reads a lot.

T2 uses technology at work because her team members do, and she can rely on them for support using one-to-one technology in instruction. T2 was skeptical and traditional when considering the adoption of innovations, which Rogers (2003) described as a late majority adopter.

Rogers (2003) described the process by which individuals adopt an innovation. Within the theory, Rogers titled Stage 1 of this process *knowledge.* Rogers explained that, in the knowledge stage, a decision-making unit becomes aware of an innovation and understands how it works. Rogers described the second stage as *persuasion*, which is when a decision-making unit forms an attitude toward the innovation. Next is the *decision* stage, which Rogers noted occurs when a decision-making unit engages in activities that prompt decisions to adopt or reject an invitation. The fourth stage of the innovation decision process is *implementation*, which Rogers described as the decision-making unit putting the decision into use. The final stage is the *confirmation* stage, which includes seeking reinforcement of the decision already made (Rogers, 2003, p. 169).

Rogers's (2003) stages of adoption relate to my study. For example, the stage of knowledge is awareness. Two participants shared how they were involved in this stage. T1 talked about asking the administration for years to obtain one-to-one technology. When considering the persuasion stage, participants shared that their input and opinions affected the decisions of which hardware to purchase. I used major areas of Rogers's theory of diffusion of innovations to compare and contrast interview data in my study.

These aspects of the theory included properties of innovations, levels of adopters, and stages of innovation adoption. The data in my study recognized and supported all three of these major parts of the theoretical framework.

Summary

The next chapter will include conclusions drawn from the literature review, the methodology, and the data analysis. Chapter 5 will also include the significance of the study to education leaders and the ways the findings may contribute to broad positive social change. Chapter 5 will include a report of the findings of my study as they apply to the research questions. In addition, the chapter will include a comparison and contrast of the results of this case study with data in the literature review. Last, Chapter 5 will include recommendations drawn from the findings of the study.

Chapter 5: Conclusions and Recommendations

Introduction

My focus in this case study was to understand the perceptions of school leaders, classroom educators, and technicians regarding the integration of one-to-one computing in one school district when viewed through the lens of Rogers's (2003) diffusion of innovations process. The problem that I addressed was the rate of adoption of one-to-one computing in U.S. K-12 schools does not meet the requirements of educational standards.

I examined levels of one-to-one computing adopters in one school district, which contrasted with Rogers's (2003) theory of diffusion of innovations. In addition, I examined why individuals are at specific levels of adoption for one-to-one computing and how one-to-one computing may affect instruction. I addressed the rate of adoption of one-to-one computing in U.S. K-12 schools does not meet the requirements of educational standards or fill the gap in the use of digital technology inside and outside of school.

Interpretation of Findings

My purpose in this qualitative case study was to analyze the perceptions of school leaders, classroom educators, and technicians from one school district regarding the integration of one-to-one computing when viewed through the lens of Rogers's (2003) diffusion of innovations process. This section includes a comparison of the literature review with conclusions of my study.

Conclusions of my study related to benefits and barriers in one-to-one computing. Responses in my study generated themes that lack of funding and low administrative

support for one-to-one technology were major barriers. Ramirez (2011) identified the lack of paid support for the integration as a barrier. Funding was the number one barrier for technology integration in my study, as reported by 100% of the participants. Ramirez also found that school officials lacked long-range planning to sustain the integration. Participants in my study noted the planning concern also. Chien (2013) reported several barriers, including a concern regarding levels of organizational support and a concern about organizational incompatibility. Webb (2011) noted that the entire hierarchy of school leadership from superintendents to principals and technology leaders affects technology integration. The findings of my study demonstrated agreement with Ramirez's, Chien's and Webb's finding that funding, low administrative support, and lack of long-range plans are barriers to technology integration. My conclusions on barriers expand and reinforce findings of current literature.

Participants also identified the benefits of one-to-one technology in my study. One of those benefits was technical support. Redish and Chan (2007) conducted a study that supported the idea of the need for strong technical support for one-to-one technology. Redish and Chan reported that school administrators needed to arrange technical support and classroom resources to ensure successful technology integration. Akbaba-Altun and Gürer (2008) also found that when teachers integrate technology into their teaching, school principals must obtain necessary technical support for teachers, which requires budgeting to obtain the support and equipment that teachers need to integrate technology successfully into the teaching and learning process. Results of my study reinforce the results of studies by Akbaba-Altun and Gürer and Redish and Chan.

Another benefit of one-to-one technology that emerged as a theme in my study was that students benefit from being able to set their own pace of learning. Johnson et al. (2009) reported that one-to-one computing provides students with rapid access to information and research-based resources. In addition, one-to-one computing can increase students' opportunities to collaborate, create, and contribute to problem solving.

One of the most significant themes generated in my study was that one-to-one technology prepares students for the future. The State of Georgia school standards, national standards, and the site in my study all included a heavy emphasis on using one-to-one technology to prepare students for the future. Ham and Cha (2009), Jackson et al. (2009), Spires et al. (2012), and Lesiko et al. (2010) noted that the United States needs citizens with technology skills to meet the nation's current and expected needs. In comparing findings from my study to the literature review, there is ample support for the claim that one-to-one technology prepares students for the future as well as other benefits and barriers discussed as themes in my study.

My study led to themes on adoption influences that also relate to the literature review. Farmakidis (2012) said that two reasons for the lack of integration of technology are that teachers do not know how to use the technology, or that they use it ineffectively. Farmakidis noted a need for a technology integration program. Of the themes generated in my study, the idea of an integration program or plan developed as a theme. Hadjithoma-Garstka (2011) found that staff relationships and the school climate influenced the implementation process. One theme emphasized in my study was that participants relied on their peers' use and knowledge of technology to try the technology

and adopt it. Participants stated that the technology has to be useful and reliable, something they can try first, something they can research, and something that, if peers use the technology, it helps them. Hadjithoma-Garstka (2011) found that staff relationships and the school climate influenced the implementation process. Ham and Cha (2009) and Ward and Parr (2011) noted that policies must provide opportunities for teachers to explore, challenge, and change teaching beliefs and practices. Themes of influences of adoption in my study included that participants strongly rely on opportunities to try technology and to observe technology and rely on peers as influences. The study findings supported and contribute to the literature related to this category of influences.

Shuldman (2004) further revealed that teacher development is critical for successful technology integration. In addition, Johnson et al. (2009) noted that rigorous ongoing professional development for teachers is critical for integrating one-to-one initiatives. The literature search indicated training for school leaders regarding the adoption and integration of technology is insufficient. The theme of low professional development emerged in my study, which may account for the wide gap among those who adopt one-to-one technology at the site. The literature clearly supported the idea of a need for professional development and time for teachers to try technology prior to adopting it in their instruction. My results reinforce the research of Shuldman and Johnson et al.

Results of my study indicated that allowing teachers to give input into the process is valuable for successful integration. Ramirez (2011) discussed the roles of school

leaders in one-to-one computing adoption and contended that providing incentives to motivate teachers to attend computer trainings and collecting teacher input on one-to-one computing is essential for successful implementation. The findings of my study aligned with the literature in the area of implementation.

Finally, Chien (2013) reported that individual incompatibility is a barrier to implementing one-to-one technology. The study by Chien aligned with my study regarding compatibility. Under the category of implementation in my study, a theme emerged that participants thought that a one-size-fits-all approach to technology will not work. The literature supported the idea that administrators cannot mandate the use of a technology plan and expect that it will succeed. Results of my study are similar to Chiens' and expand on previous research.

Parsons and Adhikari (2016) supported the use of BYOD programs in school. There is financial pressure to provide technology in schools, and BYOD relieves some of that pressure. In addition, Parsons and Adhikari noted that student-centered learning and student collaboration increase with BYOD. The amount and ease of research that students conduct increases with a BYOD policy and students feel more motivated using BYOD because they can self-pace their learning. This information on BYOD directly relates to the use of BYOD at the school in my study.

Conclusions of my study compared to studies in the literature review. Specific conclusions were on the topics of barriers and benefits on one-to-one computing integration, preparing students for the future, adoption influences, professional development, teacher involvement, BYOD, learning pace, and need for technical support.

In all of those areas, the conclusions of my study support, reinforce, and expand the current literature on one-to-one computing in schools.

Limitations of the Study

A limitation of my study was the exploration of the ideas of a group of school leaders, classroom educators, and technicians regarding the integration of one-to-one computing access in one school district. This limits the population and sample size and possibly generalizability of results. My purpose in this qualitative case study was to analyze the perceptions of school leaders, classroom educators, and technicians regarding the integration of one-to-one computing in one U.S. school when viewed through the lens of Rogers's diffusion of innovations process.

Another limitation was the sample size of my study. The sample size was smaller than intended, as some individuals who received invitations either did not respond or declined to participate. The small sample size resulted in less narrative data than expected and less detail and created a less transferable study.

Recommendations

Recommendations for further research include more studies on one-to-one computing in U.S. K-12 schools. Current literature on this topic was lacking. Some of the literature review contained older studies to obtain a historic background, but I could not locate any current studies published between 2013 and 2017. Researchers could compare and contrast the results of further studies with each other and with my study. The results may provide insight into the views of school leaders on the topic of integrating one-to-one technology in schools.

Another recommendation is that future studies may bring together school leaders from across the United States. Future studies should also have a larger sample to gain an accurate idea of the problem of inadequate levels of one-to-one computing in U.S. K-12 schools. This broad geographic range may provide school leaders with information that might improve implementation of one-to-one computing in schools. The findings of these future studies may be similar themes that would reinforce the themes found in my study, such as barriers to implementing one-to-one technology.

Future researchers could examine BYOD in schools. Results of my study indicate that funding for school technology is the main barrier. The school in my study had a hybrid approach of mixed technology, such as personal devices, Chromebook carts, Netbooks, and personal computers in a computer lab to increase access for one-to-one technology. While performing a literature review on BYOD, it was difficult to locate current literature related to BYOD in schools. Many articles exist regarding individuals bringing their own device to work but not using their own for student use.

Implications

The results of my study could lead to successful one-to-one computing integration practices. Teachers, administrators, and a technician provided consensus on 18 themes that addressed the questions and practices that can contribute to the problem of a slow rate of adoption of one-to-one computing in U.S. K-12 schools. For example, Rogers (2003) stated that triability, usefulness, and observability of innovations increases the likelihood that individuals will adopt a technology, which participants also indicated. The specific practices and beliefs that participants agreed on in my study were as follows:

1. New technology has to be useful.
2. Trying technology influences adoption.
3. Technology support in building is high.
4. Access to technology is varied and limited in the school.
5. Technology motivates and engages students.
6. Technology prepares students for the future.
7. School leaders' support for one-to-one is low.
8. Funding is a barrier to one-to-one computing.
9. Technology makes less grading work for teachers.
10. Technology used more in personal lives than at work.
11. Research and trying a technology are my information sources.
12. Peers are my information source.
13. I gave input as a role in our one-to-one technology.
14. Reliability and adaptability of technology influences adoption.
15. No formal professional development is used at the school.
16. Benefit of technology is students can self-pace.
17. A one-size-fits-all technology mandate does not work.
18. Teachers should be asked for input in adoption of technology.

These themes addressed the problem of my study, helped answer the research questions, and led to practices of the successful integration of one-to-one technology.

Significance to School Leaders

The findings indicated that change is necessary regarding how school personnel apply the implementation of one-to-one computing. For example, participants stated that the approach to implementing one-to-one computing should include feedback from all teachers as users. The results indicated that a mandated use of one type of one-to-one device would not be successful; providing options would increase the likelihood that more teachers would use one-to-one technology in instruction.

The results of my study also indicated that trying a technology and observing others using it would influence individuals' adopting the technology. Rogers's (2003) theory of diffusion of innovations, which indicates that individuals are more likely to adopt innovations if they try the innovations first and observe others using them, supports triability, usefulness, and observability. Levels of adoption increase with the comfort levels of individuals and with improvements in individuals' attitudes. The concept of increasing adoption rates could benefit school leaders in their approach to providing more one-to-one technology use. If leaders provide opportunities to teachers to try to observe technology and determine its usefulness, more teachers may adopt the use of technology in instruction.

Positive Social Change

A positive social change that may be significant to school leaders, classroom educators, students, and employers on a local and national level is that integrating technology may help to meet standards and may increase student achievement. Decision makers might use the findings to diffuse one-to-one computing in K-12 U.S. schools to

meet student needs, which could affect learners because it may increase achievement and workforce preparation and thereby contribute to positive social change. One theme in my study was that students feel highly engaged and motivated when using technology in school. Another theme was that students' level of preparation for higher education and the workforce increases when they use one-to-one technology in school.

The positive social outcomes of my study may be useful to school district personnel struggling to implement the integration and diffusion of one-to-one computing devices for students as a means to influence learner successes. School leaders might use the findings to address solutions to problems that influence U.S. K-12 learners currently and in the future with regard to educational technology.

Conclusion

A number of revelations emerged during the course of my study. Some related to the methodology, participant pool, and sample size. It took months to secure a site for my study. The initial plan was to enlist a school in the state of Florida. A lot of time went into researching Florida schools and standards to enlist participants and write about this. However, after all the effort spent on Florida schools, the site leader declined the invitation to participate. Thus, Walden staff helped enlist a school in Georgia to participate. This change involved much more time researching and writing about the new state standards and the site.

After I secured the site, the next unexpected event was being unable to obtain the target sample size. Several individuals received an invitation to participate, but most declined or did not respond. The initial plan included having a school librarian and more

than one administrator participate. Other than the building principal, administrators did not respond to the invitation. No school librarian participated either. The sample size of teachers was also smaller than planned.

The final unexpected event was the lack of existing documentation. The plan for my study included using existing documents at the school to compare and contrast with interview responses. Specifically, the intent was to use the school district technology plan. The technology department was unable to locate and forward this plan to me, which resulted in no additional documentation for the study.

Eighteen themes emerged from the analysis of the narrative responses provided in the interviews. The themes related to the research questions and theory used in my study. Participants identified benefits and barriers of integrating one-to-one technology in schools. Benefits included high motivation for students, student preparation for future college and employment, and students can work at their own pace. Another benefit that emerged was a high level of technical support in the school. The main barrier related to one-to-one computing was funding. Another barrier was low support from central administrators.

The research questions for my study were suitable for exploring how school leaders view the process of integrating one-to-one technology. Findings revealed that users should be able to try, observe, and research new technology prior to deciding to adopt it for instruction. In addition, results indicated a strong viewpoint that a mandate for all staff to use one type of one-to-one technology will not be successful.

Another theme was that students and teachers benefit from using one-to-one technology. Students are highly motivated to use technology, and using technology better prepares students for the future. Teachers indicated that a benefit for them was that technology saved them time on instruction and on work such as grading.

School leaders could use the findings in my study to address the problem of the poor integration of one-to-one technology in U.S. K-12 schools. Themes that related to this were benefits and barriers of technology and ideas for improving the adoption of technology. Additional topics of discussion included alternatives for obtaining funding. Future qualitative studies with school administrator participants on one-to-one computing in U.S. K-12 schools may be beneficial.

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Appendix A: Interview Questions

INTERVIEW QUESTION	RELATIONSHIP TO THEORY, LITERATURE REVIEW, AND RESEARCH QUESTIONS
How do school-leaders, classroom educators, and support staff at the district and building levels view the process of integrating one-to-one technology align with Rogers' (2003) diffusion process?	Theory on attitudes and beliefs, adoption stages, adopter types, and research questions 1 and 2
1. Describe yourself when trying new ideas about technology.	Theory on attitudes and beliefs, adoption stages, adopter types, and research questions 1,2
2. Describe yourself when trying new instructional practices or curricula.	Theory on attitudes and beliefs, adoption stages, adopter types, and research questions 1,2
3. When you hear of a new idea or initiative, what is your first reaction? a. What affects your attitude about changes? b. Have you changed your attitude since your first reaction? c. What events influenced your current attitude toward new technology use at your school? d. What events changed your acceptance of new technology use at your school? e. Where are you most likely to get your information from when considering a new technology or instructional practice? f. How does observing others use a new technology affect your reactions to trying it? g. How does trying a new technology	Theory on attitudes and beliefs, adoption stages, and , and research questions 1,2 a. theory on attitudes and beliefs b. theory on attitudes and beliefs c. theory on adoption stages d. other e. other f. Theory on adoption stages g. theory on adoption stages

affect your reactions to it?	
5. Are you more likely to use technology in your personal life or your professional work? Why?	Literature review
6. What is the attitude of most teachers in your school when a new technology is introduced for instruction?	Theory on attitudes and beliefs
7. What is your role with integrating one-to-one computing in your school?	Literature review and research questions 1, 2
8. When did you become involved in the process of one-to-one computing in your school? a. How were you involved in the planning stages or needs assessment for new technology? b. In what ways could you have become more involved in the process of implementing one-to-one computing?	Background information a. Background information b. Background information
9. Please describe the amount of access to technology teachers and students have at your school.	Background information
10. What are some examples of how instructional practices that demonstrate integration of technology in instruction?	Research questions 1, 2
11. How much of your typical day includes integration of technology in your teaching?	Background information
12. In what ways does professional development increase the likelihood there will be an increase use of technology in instructional practices? a. What are your preferences in the	Literature review and research questions 1, 2 a. Literature review

types of professional development offered for new technology at your school? b. What types of professional development have you participated in so far with technology use at your school?	b. Literature review
13. Describe experiences that you believe have strengthened your technology skills?	Theory attitudes and beliefs
14. Describe what types of supports are available for implementing technology. a. What types of support would you like to have more available?	Literature review and research questions 1, 2 a. literature review
15. Please describe the technical support for technology in your school.	Literature review and research questions 1 and 2
16. How do you measure student academic achievement and motivation concerning technology use? a. Have you made a connection between academic achievement and technology?	Literature review and research questions 1, 2 a. literature review
17. The technology goals and standards for the state of Georgia are embedded throughout other curricular content area standards to incorporate them into instruction and assessment. Some standards in particular relate to applied technology skills related to the workplace. How is technology use at your school helping to meet these state academic standards?	Literature review and research questions 1, 2
18. How has your leadership influenced integration of technology in teaching?	Research questions 1, 2
19. What experiences most prepared you	Literature review and research questions 1,

in your role in implementing technology initiatives in the school?	2
20. What are the potential benefits for students and classroom educators using technology?	Literature review and research questions 1 and 2
21. What barriers did you encounter with the integration of one-to-one computing in your school?	Literature review and research questions 1 and 2
22. What advice would you give to other school leaders that are preparing to integrate technology?	Other
23. Is there anything else you would like to share?	Other

Appendix B: Analysis Tables

Theory

Adopter types	Teachers	Administrators	Support staff	Total
innovators				
early adopters	1	1	1	
early majority	1			
late majority	1			
laggards				

Appendix C: Sample Consent to Participate

You are invited to take part in a research study on the topic of one-to-one computing The researcher is inviting school leaders, classroom educators, technical support staff and school librarians to be in the study. This form is part of a process called "informed consent" to allow you to understand this study before deciding whether to take part.

This study is being conducted by a researcher named Sandra Wenzel who is a doctoral student at Walden University

Background Information:

The purpose of this study is to gather information about one-to-one computing at your school in order to this study examines why individuals are at specific levels of adoption of one-to-one computing and how one-to-one computing may affect instruction.

Procedures:

If you agree to be in this study, you will be asked to:

Participate in a 1 hour interview

Possibly participate in a follow up interview for clarification or additional information

Here are some sample questions:

1. Describe yourself when trying new ideas about technology.
2. What is the attitude of most teachers in your school when a new technology is introduced for instruction?
3. When did you become involved in the process of one-to-one computing in your school?

Voluntary Nature of the Study:

This study is voluntary. Everyone will respect your decision of whether or not you choose to be in the study. No one at Walden University or Volusia County Schools will treat you differently if you decide not to be in the study. If you decide to join the study now, you can still change your mind later. You may stop at any time.

Risks and Benefits of Being in the Study:

Being in this type of study involves some risk of the minor discomforts that can be encountered in daily life, such as fatigue Being in this study would not pose risk to your safety or wellbeing

This study may benefit others as it can add to the current literature on one-to-one computing. It may also benefit other schools that are in the initial stages of integrating one-to-one computing.

Payment:

There will be no payment or gifts for participation in this study.

Privacy:

Any information you provide will be kept confidential. Also, the researcher will not include your name or anything else that could identify you in the study reports. Data will be kept secure by

storage on a thumb drive that is locked in a desk. Data will be kept for a period of at least 5 years, as required by the university.

Contacts and Questions:
You may ask any questions you have now. Or if you have questions later, you may contact the researcher via phone at 608-438-3838 or email at swenz001@yahoo. If you want to talk privately about your rights as a participant, you can call Dr. Leilani Endicott. She is the Walden University representative who can discuss this with you. Her phone number is 612-312-1210). Walden University's approval number for this study is **IRB will enter approval number here** and it expires on **IRB will enter expiration date.**

Statement of Consent:

I have read the above information and I feel I understand the study well enough to make a decision about my involvement. By signing below or, replying to this email with the words, "I consent", I understand that I am agreeing to the terms described above.

Printed Name of Participant

Date of consent

Participant's Signature

Researcher's Signature

Appendix D: Sample Letter of Cooperation

Sunrise School District
Contact Information

Date

Dear Sandra Wenzel,

Based on my review of your research proposal, I give permission for you to conduct the study entitled A K-12 Case Study to Investigate the Perceptions of School Leaders and Classroom Educators on the Topic of One-to-One Computing within a Sunshine district school. As part of this study, I authorize you to recruit classroom educators, school leaders, and support staff via email or phone calls, conduct one-on-one interviews, and report results to Walden University. Individuals' participation will be voluntary and at their own discretion.

We understand that our organization's responsibilities include providing a private space for interviews to be completed. We reserve the right to withdraw from the study at any time if our circumstances change.

I confirm that I am authorized to approve research in this setting and that this plan complies with the organization's policies.

I understand that the data collected will remain entirely confidential and may not be provided to anyone outside of the student's supervising faculty/staff without permission from the Walden University IRB.

Sincerely,
Authorization Official
Contact Information

Appendix E: Permission to Conduct the Study

June 19, 2016

Dear Sandra Wenzel,

Based on my review of your research proposal, I give permission for you to conduct the study entitled A K-12 Case Study to Investigate the Perceptions of School Leaders and Classroom Educators on the Topic of One-to-One Computing within Sunrise School. As part of this study, I authorize you to recruit myself as the administrator, six classroom educators, and technical staff via email or phone calls, conduct one-on-one interviews in person or using Skype, and report results to Walden University. I also will provide any public documents at Sunrise School related to one-to-one computing that may support the study. Individuals' participation will be voluntary and at their own discretion.

I understand that our organization's responsibilities may include providing a private space for interviews. We reserve the right to withdraw from the study at any time if our circumstances change.

I confirm that I am authorized to approve research in this setting and that this plan complies with the organization's policies.

I understand that the data collected will remain entirely confidential and may not be provided to anyone outside of the student's supervising faculty/staff without permission from the Walden University IRB.

Sincerely,
Authorization Official