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Managing One-to-One Initiatives: Implementation Analysis Through Expert Elicitation

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by

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ABSTRACT

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A qualitative phenomenological study was conducted to identify and analyze issues in the implementation of one-to-one computing initiatives and provide solutions for improvement. An understanding of the implementation process was developed through the analysis of data collected through 27 interviews with teacher experts in the field who have worked with the implementation of one-to-one programs. Teachers were purposely selected from the following groups: those who were completing their first year of teaching, those who had between two and ten years of teaching experience, and those who had eleven plus years of total teaching experience. This study distinctly addresses one-to-one initiatives from both placing importance on the utilization of negative knowledge and in simultaneously treating teacher perceptions as a valid reality. Issues associated with the implementation of one-to-one initiatives develop at a faster speed than traditional school structures are accustomed to respond to. Successful one-to-one management requires a responsive, interconnected, and efficient organizational structure. This research has significance for the improvement of one-to-one initiative implementation efforts. The findings contained in this research have the potential to benefit teachers, administrators, and other stakeholders associated with the implementation of one-to-one initiatives.

DEDICATION

This dissertation, which stands for so much more than simply a research paper, is dedicated to my wife Katharine, my beautiful children Luke and Sophia, and to my family. This achievement is not mine to celebrate. Instead, it represents a time for pause and reflection to appreciate all the people that have made a difference in my life.

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CHAPTER 1

INTRODUCTION

The idea of using technology in the classroom is not a novel one, nor is the idea of one-to-one computer initiatives. The origins of one-to-one initiatives date back to the mid-1980s with the Apple Classrooms of Tomorrow (ACOT) project (Donovan & Green, 2010). Since the mid-1990s, with the introduction of Microsoft's Anytime, Anywhere Learning program, there has been a large-scale trend to increase individual student and teacher access to computers (Penuel, 2006). As the ratio of computers to students has increased there has also been a transition in the role of the classroom instructor. This transition is one from the instructor using technological tools to dispense information to one of equipping individual students with devices and interactive software programs to assist in their acquisition of information (Spires, Wiebe, Young, Hollebrands, & Lee, 2012). This has compelled teachers to operate in the role of a facilitator (Jansen & van der Merwe, 2015; Rosen & Beck-Hill, 2012; Spires et al., 2012).

One-to-one initiatives have emerged as the driving force behind this new trend in technological innovation (Spires, Oliver, & Corn, 2012). One-to-one initiatives are increasingly being implemented around the country, especially in the last two decades (Penuel, 2006). Maine has the distinction of being the first state to provide an entire grade of students with a laptop (Garthwait & Weller, 2005). By the end of 2002 more than 17,000 seventh grade students and their teachers across 243 middle schools had an Apple iBook laptop in their possession. Michigan, through the Freedom to Learn Initiative in 2002, and Texas through the Technology Immersion Project in 2004, were the next major statewide initiatives. Both of these programs targeted approximately 7,500 students in their first year and cost millions of dollars. Initially $14.5 million was spent to get the Technology Immersion Project up and running and $7.5

million for the Freedom to Learn Initiative (Abell Foundation, 2008; Weston & Bain, 2010). In terms of significant district-wide one-to-one initiatives, Henrico County Public Schools (HCPS) Virginia, with an investment in technology ($50 million over 7 years), emerged as the leading trendsetter (Abell Foundation, 2008). HCPS began their one-to-one initiative program by issuing over 25,000 laptops to teachers and students in grades 6 through 12 (Donovan, Hartley, & Strudler, 2007). The HCPS initiative is very similar to the one from which the school in this present study belongs. Both initiatives involve approximately 25,000 devices issued and originate at the district level rather than state or individual school.

One-to-one initiatives have not gradually emerged in the educational arena but have expanded on a broad scale since the 1990's (Penuel, 2006). Initial one-to-one programs were developed as a way to provide computer access to every student at a school-based central location while more contemporary programs equip students with laptops and Internet access through school provided Wi-Fi (Penuel, 2006). Decreasing costs and increasing technological performance have allowed one-to-one initiatives to continue developing in schools across the nation (Penuel, 2006). One-to-one initiatives are unequaled to prior initiatives in terms of cost and promise (Bebell & O'Dwyer, 2010).

Providing every student with continual access to a laptop computer can radically transform the entire learning environment. Changes such as (a) the teacher as content facilitator; (b) immediate and constant access to information; (c) self-directed students; (d) personalization of learning, represent modifications to traditional instruction (Spires et al., 2012). The dynamic restructuring of traditional roles, interactions, expectations, and relationships, has led some researchers to refer to this phenomenon as a *new learning ecology* to emphasize how the entire environment and the learner's interaction with it are altered (Spires et al., 2009/2012). An

emphasis on project-oriented constructivist education enabled through one-to-one laptop computer usage has led to the use of the term *new learning ecology 2.0* (Spires et al., 2012). Constructivist learning theory promotes knowledge acquisition through practical, self-directed, challenging exploration, and reflection (Jansen & van der Merwe, 2015). Furthermore, in constructivist learning theory the instructor facilitates discussions and creates an environment conducive to student-led learning (Jansen & van der Merwe, 2015). When school officials decide to adopt a one-to-one computing initiative more than just additional technology is introduced into the learning environment. A series of complex systemic and environmental changes are introduced. Research from Spires et al. (2012) illustrated that relationships between students and teachers and between students themselves are altered, primarily in terms of communication. The relationship between the school and the pedagogy also undergoes changes. Increased access to information, personalized learning, availability of online tools, and technology-based instructional methods, represent some of the dynamic changes pertaining to one-to-one initiative adoption (Abell Foundation, 2008; Spires et al., 2012).

Wide variation exists in the way the one-to-one initiatives are designed and administered. Penuel (2006) synthesized findings from thirty different studies related to one-to-one initiatives and identified three features common to most programs.

1. Students are provided laptop computers with contemporary productivity software.
2. Internet access is provided through the school system Wi-Fi.
3. Using laptops to help complete academic tasks is a central program focus.

The variation among initiatives provides an opportunity for qualitative inquiry into the perceptions of experienced practitioners involved in implementation of the initiatives. Teachers who have experienced the implementation of one-to-one initiatives possess direct knowledge and

experience that could contribute to the enhancement of future implementation processes. Educators' collective knowledge often remains in a fragmented and unpublished form. Therefore, it is important to elicit, analyze, and share information from teachers to develop a systemic understanding of one-to-one initiative implementation. Through the analysis of this information a greater understanding of one-to-one program implementation may be determined. This research will allow for increased efficiency and improved results for future one-to-one initiatives. Analysis of teacher perceptions related to one-to-one initiatives will provide for the identification of areas that present an opportunity for improvement in practice and policy. This study draws upon the often underutilized real-world expertise of educators charged with one-to-one implementation. Despite the knowledge gained from practical one-to-one implementation, "It is often the case that teachers, while being held responsible for implementing change in schools, are rarely consulted in the reform, development, adoption, or evaluation process; yet given their expertise and skill, these are the very voices that are necessary in any discussion about school reform" (Storz & Hoffman, 2013, p. 5). Teachers within a one-to-one computing environment are charged with implementing and refining one-to-one initiatives while operating in direct proximity to students (Spires et al., 2012). Therefore, teachers possess valuable and specialized knowledge. Teachers can provide one-to-one implementation data that can inform other instructors and policy makers.

Statement of the Problem

The purpose of this phenomenological study is to identify and analyze the process of implementing one-to-one computing initiatives. An understanding of the implementation process will be developed through the analysis of data collected in interviews with experts in the field who have worked with implementation of one-to-one programs. The basic principles of the

expert elicitation process, which include the use of expert participants, several rounds of interviews, seeking consensus between rounds, multiple member checks, and extra time allotted for participant preparation, will be utilized throughout this study (Boring et al., 2005). Expert elicitation is "a formal process of obtaining information or answers to specific questions about certain issues that are needed to meet certain analytical objectives" (Ayyub, 2000, p. 35). Furthermore, expert elicitation is used to gather knowledge in domains that involve significant uncertainty (Rai, 2013). Opinions from multiple experts are gathered and aggregated to create a risk assessment when there is little other operating data regarding a complex or poorly understood phenomena (Boring et al., 2005). Expert elicitation in this study is used in a broader sense that refers to the systematic evocation and integration of expert opinions in an area of complexity and uncertainty. Synthesizing the collective perspectives of those responsible for the implementation of one-to-one initiatives can lead to greater understanding of implementation processes. Greater understanding of these processes may result in recommendations which could improve future implementation efforts.

There are studies that have evaluated teacher attitudes prior to and during initial implementation of one-to-one initiatives (Adiguzel, Capraro, & Wilson, 2011; Donovan & Green, 2010; Donovan et al., 2007; Penuel, 2006) and those that test for academic improvement resulting from one-to-one initiative policy (Bebell & Kay, 2010; Kuyatt, Holland, & Jones, 2015; Rosen & Beck-Hill, 2012). Despite these studies, there remains a lack of understanding related to implementation processes surrounding one-to-one initiatives. Individual teachers are aware of the immediate activities and challenges taking place in their classroom. However, individual teachers who operate in a limited collaborative environment struggle to connect experiences in the classroom with broader issues surrounding the implementation process and the execution of

the one-to-one initiative at the classroom level and beyond (Ostovar-Nameghi & Sheikhahmadi, 2016). Whereas an individual teacher may only be able to offer fragments of insight into the root causes of implementation issues, the contributions from an expert panel provides more complete data (Ayyub, 2000). Therefore, the use of expert elicitation in this study draws information from a purposefully selected group of teachers regarding issues, causes, and solutions that go beyond a single teacher's individual scope.

Providing every student with a laptop or other device and incorporating the devices into instruction on a regular basis is a complex process involving issues inside and outside the classroom (Bebell & O'Dwyer, 2010). One-to-one initiatives offer promise for differentiated instruction and efficiency as educators struggle to raise achievement levels within high stakes testing environments. However, the introduction of technology does not automatically correlate to higher student achievement and can result in decreased performance when not implemented with the proper skill and planning (Kuyatt et al., 2015). Moreover, an understanding of prevalent issues is vital and is considered necessary for distinguishing between correct and incorrect processes, facts, and surroundings (Rach, Ufer, & Heinze, 2013). A study of implementation through an analysis of prevalent teacher identified issues in a one-to-one initiative is somewhat distinct from previous studies. Perhaps, as Rach et al. (2013), suggest, this is due to negative feelings associated with errors because of the way errors are used to assess performance of individual actions. However, there is value in understanding the source of implementation issues in one-to-one initiatives as a means to increase efficiency and success in the implementation of future one-to-one initiatives.

Research Questions

1. What are teacher concerns regarding issues that occur in the implementation of one-to-one initiatives?
2. What are teacher perceptions of how to improve policy and practice of one-to-one implementation?
3. How can the elicitation of knowledge gained from experiencing and analyzing issues in one-to-one implementation create opportunities to enhance student learning?

Significance of the Research

This research is significant in that it adds to the body of knowledge regarding one-to-one initiative implementation. The findings may increase the efficiency in future technology implementation. In addition, the findings may aid in cost-effective decision-making and ultimately an increase in student achievement levels. Utilizing technology in the classroom through one-to-one initiatives should be based on sound research and the feedback of those already immersed in such initiatives (Kuyatt et al., 2015). According to Kuyatt et al. (2015), "It appears that it is not enough to use technology by teachers or students but to understand and identify factors that would be able to contribute to student learning" (p. 68). This study supports that recommendation by seeking to identify factors that hinder teaching and student learning within the context of one-to-one initiative implementation.

A central focus of education is to increase student achievement. Therefore, unless there is convincing evidence as to the potential of technology to support this aim it will not be readily accepted (Cox, 2013; Zhao & Cziko, 2001). "Sound guidance on how to implement technology in ways that produce student learning gains is integral to efforts to use technology as a lever for education change" (Means, 2010, p. 287). Information gathered from this study will be utilized

to develop recommendations for the support of educators involved in the implementation of a one-to-one initiative. This support will help avoid common problem areas inherent in policy and procedural decisions. By identifying common areas of systemic difficulties with implementation of one-to-one initiatives this study will benefit all people who will play an active role in future implementation of one-to-one computing initiatives.

Definition of Terms

The following terms are defined for the purpose of this study.

1. Constructivism: Educational practices that are student-centered, meaning-based, process-oriented, interactive, and flexible according to student interest. (Halverson & Smith, 2010; Johnson, 2009).
2. Issues analysis: The systematic study of deviations from target behaviors that interfere with the success of the one-to-one initiative (Oser & Spychiger, 2005)
3. Expert elicitation: The systematic evocation and integration of expert opinions in an area of complexity and uncertainty (Ayyub, 2000; Boring et al., 2005; Rai, 2013).
4. Instructionsim: Educational practices that are teacher-centered, skill-based, outcome-oriented, and non-interactive, where students are the passive participants in the learning process. (Halverson & Smith, 2010; Johnson, 2009).
5. One-to-one initiative: An education-based policy of providing each student individual access to a portable laptop computer that has both Internet access and educational productivity software (Abell Foundation, 2008; Penuel, 2006)
6. Ubiquitous computing: “On-demand availability of task-necessary computing power” that extends beyond educational boundaries and encompasses the use of any device for

personal, business, or other uses in any location (van Hover, Berson, Bolick, & Swan, 2004, p. 107)

7. Negative Knowledge: Knowledge about incorrect facts and procedures gained primarily from individual experiences in error situations (Rach et al., 2013)

Limitations and Delimitations

This study employed a maximum variation sampling strategy in which participants were chosen across three one-to-one experience levels. The sample pool was confined to approximately 40 teachers. Three participants from each of the following categories were selected; teachers with five or more years of experience prior to teaching in a one-to-one setting, teachers with between one and four years of experience prior to teaching in a one-to-one setting, and newer teachers who have only worked within the current one-to-one program. Therefore, a limitation of this study is in the sample size selected by the researcher. While a larger sample pool may provide data that is more transferable, restrictions on sample pools size was offset by the advantages of close proximity to participants, ease of access, and familiarity with individual school and district policies.

Another limitation is that the student population used in this study may differ from others involved in one-to-one initiatives. The specifics of the students' backgrounds, experience with technology, Internet access at home, and parental support, limits the transferability of the findings to other populations.

In addition, participants in this setting may respond in atypical fashion when interacting with the researcher due to a fear that their responses could lead to punitive measures (Patton, 2002). The caution of educators to express perspectives highlighting and critiquing school and district policies has the potential to impact the reliability of the data. Therefore, gaining the trust

of teachers and obtaining unfiltered answers to interview questions represent a limitation that the researcher has taken into consideration. Interview limitations such as personal bias, recall error, and self-serving responses have been taken into account in the design of the methodology, including the informed consent and study background information provided to all participants (Patton, 2002).

Overview of the Study

The focus of this phenomenological study is to identify and analyze the process of implementing one-to-one computing initiatives. The origins of implementation issues were developed through the analysis of data collected in interviews with experts in the field who have worked with implementation of one-to-one programs. Interviews with experts in the field provided valuable information to establish in-depth understanding of implementation processes and for making recommendations for future one-to-one implementation efforts. This study is composed of five chapters. Chapter 1 presents information that supports this qualitative research. Chapter 1 also includes an introduction into the growing one-to-one initiative movement, outlines the central research problem being addressed, defines key terms used, and examines limitations of the study. Chapter 2 is a review of research related to the topic of this study. Chapter 3 details the methodology, design, sample and sampling strategy, data collection and analysis, role of the researcher, measures of rigor, and bias. Chapter 4 presents an analysis of the data and results of the study. Chapter 5 contains a summary of the findings and offers conclusions and recommendations as well as suggestions pertaining to further research.

CHAPTER 2

REVIEW OF LITERATURE

Introduction

Issues analysis and the utilization of negative knowledge gained through experiencing errors and challenges represents a new approach to studying one-to-one initiative implementation. Some researchers have argued that the benefits of analyzing negative knowledge have not been fully realized in education due to the fear of severe consequences for individuals and organizations operating under a high level of accountability (Fullan, Rincon, & Hargreaves, 2015; Keith & Frese, 2008; Rach et al., 2013). Keith and Frese (2008) attribute avoidance of consequences regarding the analysis of negative knowledge as to why "many scholars in the area of learning and training have taken a negative view of errors" (p. 59). However, learning from negative knowledge within an error tolerant environment has been demonstrated to be more effective than its avoidance (Rach et al., 2013). This study utilizes one-to-one implementation issues as the foundational data to attribute causes and subsequent solutions. While this approach is distinct from previous one-to-one studies, it is strengthened from first reviewing literature related to error management, common implementation issues across industries, and the main approaches to which one-to-one implementation has been evaluated previously.

One-to-one initiative implementation in schools consists of unique challenges while also sharing issues that are common in various organizational structures. Issues inherent in the implementation process, particularly those regarding the introduction of new technology, occur in organizations across various industries (Edmondson, Bohmer, & Pisano, 2001). The new technology represents a disruption to established routines. These routines provide a sense of

stability that is purposely upset as the new innovations are incorporated. In a qualitative field study of 16 hospitals implementing new technology for cardiac surgery, Edmondson et al. (2001) found that the manner in which a technology is framed and the interpersonal skills of team leaders directly impact successful implementation. Banerji (2013) analyzed the implementation issues regarding the introduction of IT techniques across Human Resource functions and identified similar challenges as those faced in other industries. Factors such as work culture, employee motivation, security concerns, employee technical limitations, ongoing training, learning, and feedback, are common concerns in the implementation process (Banerji, 2013). This study of one-to-one initiative implementation in schools has a specific focus on the impacts on student teaching and learning while also contributing to the cross-industry benefit of illuminating the collective learning process within an organization (Edmondson et al., 2001).

Literature on one-to-one initiatives is an emerging field of research. To date, much of the research has focused on two broad areas, attitudes and student achievement. There are a number of studies that seek to understand the attitudes and feelings of participants involved in one-to-one programs, be they teachers, students, or administrators (Adiguzel et al., 2011; Donovan & Green, 2010; Donovan et al., 2007; Yun-Jo, & Reigeluth, 2012). A second significant category of research is composed of studies that analyze the effectiveness of one-to-one programs by evaluating student achievement and other related measures, often through the use of standardized test scores (Bebell & O'Dwyer, 2010; Bebell & Kay, 2010; Kuyatt et al., 2015; Rosen & Beck-Hill, 2012; Shapley & Sheehan, 2010). Other major topics include studies concerning trends in educational technology (Abell Foundation, 2008; Halverson & Smith, 2010; Jansen & van der Merwe, 2015; Penuel, 2006) and teacher instructional techniques and competencies (Bang & Luft, 2013; Cydis, 2015; Gilakjani, 2013).

In examining the current movement surrounding one-to-one initiatives it is important to first be conscious of where the movement began. The difficulty with this is that current one-to-one initiatives emerged out of a general integration of technology that began in the mid-1980s and hardly resembled the programs of today (Donovan & Green, 2007). Even to group these initiatives under the same category is misleading because the sole characteristic that is signified by the term one-to-one initiative is the level of access to technology available to students, one computer for every student (Downes & Bishop, 2015). The actual educational practices are not taken into consideration under the broad definition and therefore represent a challenge in conducting research and often leads to contrasted evidence (Downes & Bishop, 2015). Regardless of where one sets the origin and with what criteria the programs are grouped, one-to-one initiatives represent perhaps the most widespread, dramatic, and expensive movement to ever affect American classrooms (Bebell & Kay, 2010). Weston (2010) states, "Quite possibly, 1:1 initiatives collectively represent heretofore-unattained scale and disturbance in the equilibrium of classrooms and schools" (p. 9).

The purpose of this literature review is to establish the importance of advancing academic knowledge related to one-to-one implementation and to highlight relevant studies. In addition, the literature review will add context regarding the path that this inquiry has taken by presenting a history of one-to-one initiatives and associated scholarly studies. Lastly, the literature review strengthens the argument that sufficient experience and data exist regarding one-to-one initiatives to warrant the analysis of common issues in policy and practice.

Significant Programs and Trends

The one-to-one movement can be traced back to the mid-1980s with the Apple Classrooms of Tomorrow (ACOT) project. This program represents the first large scale attempt

to equip students and teachers with access to computing technology at a ratio of 1:1 during both the school day and at home (Donovan et al., 2007). ACOT, which lasted from 1985 to 1995, originally accomplished this level of computing access despite the bulk of the desktop computers by providing each student and teacher in the program with two computers, one for school and one for home (Apple Computer Inc., 1995).

It was not until 1996, with the Microsoft Anytime, Anywhere Learning (AAL) program that the first laptop-based one-to-one initiative was launched (Donovan et al., 2007). Under the AAL program students could lease or buy computers that they and their teachers were expected to use at school (Penuel, 2006). Initially the program consisted of 53 different laptop pilot school sites ranging in size at each location from between 19 students to 510 (Rockman *ET AL*, 1997). By the end of the third year the program had grown to include 800 schools and 125,000 students and teachers who were using computers with Microsoft Office and that had Internet connectivity (*Anytime Anywhere Learning Program Uses Technology to Bridge the Digital Divide*, 2000).

ACOT and AAL represent foundational pilot programs that have paved the way for a steady increase in the both the magnitude and technological sophistication that has occurred over the last twenty years (Dunleavy, Dextert, & Helnecket, 2007). They represent a departure from the traditional technological investments by schools in which new computers were placed in commonly underused centrally located computer labs (Penuel, 2006). They also represent a more student-centered approach in which the technology is used to increase productivity and information access at times most convenient for students and teachers. Prior to these programs computers were originally used in schools for administrative and secretarial tasks. It was not until the mid to late 1980s that computers began to be utilized primarily by teachers for instructional purposes such as creating worksheets, record keeping, and preparing lesson plans

(Grundmeyer, 2014). Teachers utilized this new technology to enhance productivity, increase accuracy, and analyze data, as a means to enhance classroom learning and improve instructional methods (Grundmeyer, 2014).

These programs and initial investments, as advanced as they may have been for their respective time, were primarily driven by private business interests rather than large scale public investment. Technology investments in schools continue to grow as costs decrease and portability of devices improve (Downes & Bishop, 2015; Penuel, 2006). Computers with Internet access in schools have more than tripled since 2000 and the student to computer ratio has gone from almost 7:1 to less than 3:1 (Snyder & Dillow, 2015). By 2003, 100% of American schools had access to the Internet and today almost every teacher in the nation has a classroom computer (Grundmeyer, 2013). Current research can now focus on ways of extracting knowledge from current models, learning from the experience of experts, investigating the most successful ways to introduce the technology, and studying within what type of environment one-to-one initiatives are most successful.

Attitudes, Beliefs, and Feelings

Teacher attitudes towards the use of technology in the classroom, specifically the adoption and administration of one-to-one computing in everyday instruction, are a key factor in the effectiveness of the program and in evaluating its possible shortcomings (Adiguzel et al., 2011; Gilakjani, 2013). One-to-one initiatives represent complex systems that in part require teachers to buy-in for successful implementation and innovation (Hall & Hord, 2001, as cited in Donovan et al., 2007). However, teachers undergoing this complex change are rarely consulted as to the usefulness of the incoming technology and yet are expected to adopt it with open arms (Richardson & Placier, 2001; Tyack & Cuban, 2000, as cited in Donovan et al., 2007). Literature

that addresses concerns in this area is valuable in identifying the potential roots of prevalent issues later in this study.

Donovan et al. (2007) studied the concerns of teachers during the implementation of one-to-one initiatives at the middle school level. The objective of the study was to examine one-to-one computing from the perspective of those being asked to implement the change. Their results indicated that teachers fell within two well-defined categories regarding their initial concerns. One group was concerned with how the technology would affect them personally in terms of issues such as time management and lesson planning. The second group of teachers, which was much smaller than the first, was concerned with the needs of the students and how to maximize the effectiveness of the technology. Teachers with predominantly personal concerns regarding the technology were the most reluctant to integrate and innovate. The teachers with primarily management-type concerns were found to be those putting forth the greatest effort to utilize the technology.

Donovan et al. (2007) make the point that successful adoption of a new technology is rooted in an understanding of the concerns of those charged with its successful implementation. Teachers' feelings of stress, time management issues, and various external pressures related to the adoption of technology represent a barrier to successful implementation (Cox, 2013). Teacher willingness to buy-in is associated with whether the disturbances caused by implementation of the one-to-one initiative will be offset by student achievement gains beyond what current tools have produced (Cox, 2013; Zhao & Cziko, 2001). Perceived usefulness of the new technology is a key component in shaping the attitudes, feelings, and beliefs of the teachers and increasing the likelihood of successful implementation (Li, 2007). As Cox (2013) noted, successful technological integration on the part of teachers was achieved only when they associated the

technology as "part of a more holistic educational experience" in which technology use was not the goal, but a means to achieve a greater goal" (p. 216). The incorporation of additional technology and the disturbances and challenges caused by it, were more successfully implemented when teachers' attitudinal barriers and concerns related to adoption were offset by a broader understanding of the holistic benefits to student growth.

Not only is it important to understand the concerns of teachers prior to implementation, it is important to continually be receptive to the voice of the teachers in order to plan successful professional development in critical areas (Cox, 2009). As the issues analysis was conducted in this study this was an area of particular interest. Focusing on teacher concerns is vital when so much is expected of them. For many teachers, working within a one-to-one teaching environment means external pressures to modify teacher-centered instructional practices (Donovan et al., 2007). Teachers who are more traditional in their approach are being asked to not only accept a one-to-one initiative but to also alter their instructional methods and adopt a more constructivist or student-centered philosophy (Donovan et al., 2007; Lim & Chan, 2007). Rather than the teacher as the center of attention, one-to-one initiative policies generally support a learner-centered environment where student discovery and independence are emphasized (An & Reigeluth, 2012). Ongoing dialogue with teachers can influence professional development objectives and increase effective communication between important stakeholder groups (Li, 2007).

Donovan and Green (2010) found that engaging faculty in the design process is important if for no other reason than the open dialogue serves to alleviate their personal concerns and helps guarantee their support during the implementation process. Faculty preparation prior to the experience of the one-to-one experience is critical (Donovan et al., 2010; Zhao & Cziko, 2001).

When a school or district fails to adequately involve the faculty in the program design and does not structure one-to-one professional development around expressed teacher apprehensions teachers are less likely to embrace the one-to-one initiative (Cox, 2009; Donovan et al., 2010; Zhao & Cziko, 2001).

Adiguzel et al. (2011) found that special education teacher resistance to new technologies is high. The two most significant factors that impacted technology acceptance were the perceived usefulness of the device and the anticipated ease of use. While these were the two biggest concerns from teachers the researchers found that the resistance was largely dependent on whether or not the new technology's implementation was planned appropriately and whether teachers were provided with enough information beforehand regarding how the computers will help them fulfill their classroom tasks and responsibilities. A lack of pre-service training and inadequate professional development regarding the design of learner-centered environments contributes to a discrepancy between philosophy and practice that inhibits the creation of an optimal environment for the new technology (An & Reigeluth, 2012).

When looking at teacher attitudes and concerns regarding the adoption of one-to-one computing in the classroom it is important to look at how teachers assess their own instructional practices as opposed to focusing entirely on the technology as an external addition upon a prepared and cooperative faculty. If the teacher already believes his or her instructional practices are conducive to the one-to-one initiative he or she is less likely to be open to change (An & Reigeluth, 2012). An and Reigeluth (2012) conducted a study involving online surveys with 126 teacher participants regarding teachers' beliefs, barriers, perceptions, and support needs as they relate to the creation of "technology-enhanced, learner-centered classrooms" (p. 54). The results of their study indicated that teachers held positive beliefs about the use of technology and most

(70%) reported that they were already learner-centered teachers (27.6% neutral) (An & Reigeluth, 2012). However, there was a divergence between what teachers said they were doing and what was actually taking place, especially in relation to whether or not the classroom environment was conducive to a one-to-one initiative. Similarly, if teachers regard their current teaching methods as sufficient to meet their higher-level professional goals their resistance to additional technology and policies will be increased (Zhao & Cziko, 2001).

To some teachers the computers represent an unwelcomed complication devoid of substantive benefit. Zhao and Cziko (2001) interpreted and synthesized various studies regarding teacher use and avoidance of technology. Three major themes emerged from the findings. First, teachers must believe that the technology will help them attain higher-level goals than what was previously used. Secondly, that the technology will not cause disturbances to other higher-level goals that are more important than the one being maintained. Third, that the teacher will have the ability and support to effectively use the technology (Zhao & Cziko, 2001). The absence of any of these three themes will promote technology avoidance by the teacher. For example, the following teacher feedback was quoted as being emblematic of this type of technological resistance, "It didn't do anything I couldn't do easier and cheaper on the blackboard" (Zhao & Cziko, 2001, p. 8). Another teacher responded that, "If I could see a really good use for a computer I would use one... but I have yet to think of anything I could do on a computer that I cannot do by myself just as well" (Zhao & Cziko, 2001, p. 8). Therefore, in examining teacher attitudes, feelings, and beliefs associated with the adoption and implementation of technology it is important to see teachers as "purposeful human beings whose behaviors are goal-oriented" (Zhoa & Cziko, 2001).

The introduction of technology may change the physical setting while attitudes and beliefs of educators remain unaffected. When teacher attitudes and beliefs are not addressed prior to and during implementation of a one-to-one initiative teacher resistance may result in the computers becoming "souped-up typewriters" (Li, 2007, p. 391). Overriding the teacher's curiosity with the potentials of the new technology is the desire for the perpetuation of current successful instructional practices. As stated by Li (2007), when speaking of teacher reliance on traditional methods, "Their goal to survive, therefore, leads to their rejection of technology" (p. 392). This supports the "over-sold and under-used" phenomenon espoused by Cuban (2001) in which saturation and access pertaining to technology did not necessarily equate to increased usage.

An and Reigeluth (2012) found that a traditional factory model of education is not the type of environment best suited for one-to-one computing and for the information age in general. The ideal environment, according to the researchers, would be one that is learner-centered, has personalized learning, emotional support, self-regulation, individualized assessment, and high levels of technology integration (An & Reigeluth, 2012) Different learning environments promote various learning experiences and therefore stimulate particular education objectives (Rosen & Beck-Hill, 2012). However, teacher attitudes and beliefs regarding technology integration and what constitutes optimal instructional methods serve as the foundation of the learning environment.

Student Achievement

Studies that focus on student achievement within a one-to-one computing environment represent important sources of information related to implementation issues and potential solutions. Student achievement data analysis as it relates to one-to-one computing is essentially a

study of the value-added by the initiative. Major themes emerge from the literature when comparing the results of one-to-one implementation. Themes in student achievement outcomes in one-to-one initiatives are: a reported increase in technology use, increased student engagement and interest levels, and a slight or modest increase in terms of student achievement (Bebell & Kay, 2010; Bebell & O'Dwyer, 2010; Shapley, Sheehan, Maloney, & Carnikas-Walker, 2010). However, these often reported results require a closer examination before gauging effectiveness. A rise in technology usage is expected given the increase in devices and in accessibility. Engagement and interest are ambiguous terms that are difficult to accurately define and measure. That leaves the inconsistent and sometimes contradictory evidence of student achievement gains, most frequently measured by standardized test results.

The addition of technology into a classroom in and of itself does not automatically lead to achievement gains or losses (Cheema & Zhang, 2013; Kuyatt et al., 2015, Lei, 2010). There are several other important factors of student achievement and benefits that fall outside of the measure of standardized test data although it tends to be the most significant indicator of program success within an atmosphere of high-stakes accountability (Cheema & Zhang, 2013). Lei (2010) argues, the premise that "technology plays a crucial role in student achievement has not been substantially supported by empirical evidence" (p. 456). Various empirical studies related to technology use and student achievement demonstrate inconsistent and sometimes contradictory findings (Lei, 2010).

Closer examinations of reported student achievement data in relation to one-to-one initiatives is important considering the complexity and number of variables that influence various performance outcomes. Bebell and Kay (2010) studied the Berkshire Wireless Learning Initiative (BWLI) and found increases in student engagement, motivation, and improved research skills.

Principals and teachers were nearly unanimous in their positive reviews with 100% of the 32 administrators reporting that the program positively impacted their students' academic achievement (Bebell & Kay, 2010). In addition, 84% of teachers reported that engagement had improved for their students (Bebell & Kay, 2010). While there is some evidence of improvement by schools within the program there were many additional factors that may have influenced the findings. The researchers state, "Without a true experimental design, this trend analysis does little to prove that the 1:1 pilot program improved test scores" (Bebell & Kay, 2010, p. 39). Despite teachers and administrators attributing academic improvements to the one-to-one initiative, the researchers were not able to substantiate those claims.

This gap between the teachers' and administrators' opinions of the effectiveness of the program and that of the actual test results highlight a central issue in educational research related to technology use. The issue is that educators and administrators are accustomed to putting a positive spin on what occurs in their school. This is primarily due to the high level of external accountability in U.S. schools that is used as a "lever for improvement" (Fullan et al., 2015, p. 3). Concerns over punitive accountability tend to suppress transparency and incentivize the dissemination of positive news, sometimes at the expense of accuracy (Fullan et al., 2015). Therefore, researchers have to dig deeper into what is actually taking place in analyzing one-to-one student computer usage. For example, the researchers in the BWLI study, for the most part, took the word of the educators and administrators as to whether student engagement and motivation had increased. They did use limited classroom observations as a form of triangulation to verify the survey data (Bebell & O'Dwyer, 2010). However, the observational data did not include specifics regarding what the students were actually doing on their computers. It did not state what tasks they were performing nor the level of complexity. The researchers note that the

students were excited to use their computers and frequently asked their teacher if they would be using the computers that day. However, a student staring at their computer or even involved deeply in something does not mean that that they are effectively engaged in their schoolwork. A student shopping for shoes online who is seated next to another student working on their math assignment might look similar to an outside observer when in reality they are engaged in completely opposite tasks in terms of the objectives of the technology program. For example, one student who was interviewed in a qualitative study by Storz and Hoffman (2013) stated that students were less disruptive because they were "consumed by the computer," mostly by the music and games now available (p. 11). Being consumed by the computer and the kind of engagement educators praise through the use of laptops can be contradictory. This is also true for the students who come into the rooms excited to use their computers and who cheer when the teachers say they will be using the laptops that day. The origin of the excitement is an important factor. It is not accurate enough to assume that the excitement is related to schoolwork, although it may be. It might also be for other reasons that could involve off-task, unproductive behavior. When these kind of discrepancies exist between the positive picture being painted by school personnel and the test results, which show minimal gains or even losses, there exists shortcomings or flaws somewhere in the complex system that needs to be identified through elicitation of professionals. These experts as a collective group and with the aid of a coordinating researcher may be able to identify the most prevalent issues and offer solutions.

Some uses of technology produce negative effects on student academic achievement and therefore warrant an analysis of quality usage as well as quantity (Cheema & Zhang, 2013). Internet access to support homework tasks is a positive effect while the simultaneous access to Internet-based non-academic games serves as a negative distraction in terms of academic

achievement. Lei (2010) found that "no significant relationship was found between technology use and any student outcomes" when only examining how much time was spent on computers (p. 467). However, when different computer-based activities were analyzed in relationship to student outcomes significant association was identified (Lei, 2010). The study found that the introduction of technology should not be expected to increase student performance due to the numerous factors that mediate technology use such as environmental influences, differences among individual users, the specifics of the technology, and dynamic interpersonal interactions (Lei, 2010). The implications of quality use as being more influential to student achievement outcomes than quantity can be used to influence district and school budgetary decisions. Analysis of quality computer use and specific beneficial instructional practices related to technology can aid in policy decisions when faced with choices between investment in technology support infrastructure versus sheer quantity of computers (Cheema & Zhang, 2013).

The complexity of the one-to-one initiatives make it difficult to find causal links between apparent statistical correlations. Shapley et al. (2010) used the Technology Immersion Model, consisting of a laptop for every student and teacher, wireless Internet access, curricular and assessment resources, professional development, and ongoing technical and pedagogical support, to examine how implementation indicators were linked to student outcomes. The findings of their study indicate a strong correlation between levels of student achievement in math and reading and the extent to which they used a laptop outside of school for homework. This correlation was the strongest predictor of TAKS (Texas Assessment of Knowledge and Skills) reading and math scores. This factor drove up the aggregate implementation score which compared test scores with the number of days a student had a computer, frequency of technology use for learning in core-content classes, and laptop use for homework and learning-related games

(Shapley et al., 2010). While time spent on the laptop was associated with higher scores, no causality was established. Students who used their computers the most for homework may have already been the top achievers who would have produced higher results with or without the addition of the laptops.

In this same study by Shapley et al. (2010) the researchers reported that there was not a statistically significant link between the school and the teachers' level of Immersion Support and TAKS reading and math scores. The Immersion Support level represents a composite measure of implementation resources such as leadership, teacher support, parent/community support, technical support, professional development, classroom immersion, and lastly, student access and use (Shapley et al., 2010). Essentially these results support the construct that students who did their homework, albeit on a laptop, had higher scores than students who spent less time on homework, whereas the efforts of the school and community to support the one-to-one initiative seemed to have little impact on standardized test scores. Therefore, additional research into the specific practices and beliefs of teachers as well as an examination into one-to-one policy specifics that are contributing to lackluster returns on investment is essential.

One-to-one initiatives that seem to produce the best results are those that take into consideration the understanding that there needs to be a major transformation in teaching practices and philosophy for success. The transition from instructionism or teacher-centered instruction to a student-centered or constructivist environment is consistent with the goals of one-to-one initiatives (An & Reigeluth, 2012; Donovan et al., 2007; Lim & Chan, 2007). Rosen and Beck-Hill (2012) studied the impact on student achievement when a one-to-one initiative was implemented in a teacher-driven, student-centered, technology-rich environment. They defined these conditions as having the following five main components; a one-to-one laptop

ratio, workstation for the teacher, digital learning platform, pedagogical support, and technical support (Rosen & Beck-Hill, 2012). Student achievement was measured through the Texas Assessment of Knowledge and Skills (TAKS). The results of the study showed that the students receiving the laptops and other supports significantly outperformed the control students in reading and math (Rosen & Beck-Hill, 2010). The researchers also noted that students who were issued the laptop computers had less discipline issues.

The results of the study by Rosen and Beck-Hill demonstrated increases in student achievement. The success of the program was attributed to a constructivist technology-enriched model which has at its foundation the premise that, "knowledge is not transferred from teachers to students but is instead the result of collaborative activities within the learning environment" (Rosen & Beck-Hill, 2010, p. 236). Teachers reported that they were able to differentiate instruction easier with the use of the technology and the digital learning platform whereas the control group expressed frustrations over differentiation (Rosen & Beck-Hill, 2010).

A review of one-to-one initiatives demonstrates that the computers themselves do not result in positive outcomes the more they populate the school environment (Abell Foundation, 2008; Kuytatt et al., 2015). Kuyatt et al. (2015) demonstrated technology integration leads to significantly lower student performance when they compared teacher technology use in the classroom to Texas STAAR scores. This is critical because it supports the concept that it is how the technology is used rather than simply the quantity of use that has the most impact (Cheema & Zhang, 2013). Key to the implementation of successful one-to-one initiatives is the preparation by educators for more than the introduction of additional technology. Research supports the finding that a paradigmatic change in the teaching-learning relationship is a critical component (Rosen & Beck-Hill, 2012; Spires et al., 2009/2012). The dynamics of the system to which the

computers are introduced is so complicated and nuanced that qualitative research is necessary to analyze quantitative correlations. This study is founded on the premise that one-to-one educational practices can benefit by delving into specific implementation issues and causes based around the collective experiences and perspectives of the teachers in the field.

Identifying Issues through Analyzing Challenges

Challenge and error are not interchangeable terms but are closely related through potential causation of issues. A challenge represents an obstacle toward a goal. An error refers to the deviation from target behaviors that interfere with the success of the goal. Challenges are not necessarily errors but challenges may sometimes have their origins in errors of policy and or practice or be exacerbated by them. Shortcomings in policy or practice can create additional challenges or make existing ones worse. Off-task student behavior is definitely a challenge when implementing one-to-one initiatives. Laptops may lead to off-task behavior by students due to such things as excitement with the new product, e-mail, games, music, and Internet connectivity (Dunleavy et al., 2007; Lei & Zhao, 2008; Storz & Hoffman, 2013). Storz and Hoffman (2013) quoted one teacher dealing with behavioral issues as saying, “Unless you are directly over their shoulder they’re going to want to access their iChat” (p. 11). This common issue of off-task behavior is an example of both a challenge and a potential error. Challenges are part of the profession and will exist even in a perfect system. Potential errors may include computers introduced without software programs for teachers to monitor students, thus allowing them to conceal their activity. Errors may also arise from classroom configuration or lack of teacher training etc. Off-task behavior, a regular challenge, may be made worse through shortcomings within the system.

Classroom challenges may in part stem from weaknesses in teaching methods and/or policy decisions. Unwanted classroom management issues can be made worse by a lack of teacher preparation and professional development (Zhao & Cziko, 2001). Off-task behavior can be worsened by the way in which laptops are distributed to students or by a lack of adequate student monitoring software or other such safeguards. The quality of the lesson plan, class size, and complexity of the assignment represent additional variables. The potential variables contributing to increased classroom challenges could continue ad infinitum. The point is that a challenge, identified through expert elicitation, has the potential to lead back to specific issues which are causing the overall system to perform below an optimal level. That is why studies that highlight challenges, engage in issue analysis, and provide recommendations on how to best learn from our mistakes, are utilized in this paper and are briefly covered in this literature review. An analysis of issues through expert elicitation in one-to-one computing represents a new type of study and synthesizes ideas and methods from prior studies.

Learning from Experience

Rach et al. (2013) divide knowledge acquisition into two main categories, positive knowledge and negative knowledge. Negative knowledge originates from incorrect facts and procedures while positive knowledge comes from correct facts and procedures (Rach et al., 2013). While the latter form of knowledge acquisition is typically more highly valued and used in schools, the former, negative knowledge, is often avoided, although they are complimentary and individuals benefit from both of them (Minsky, 1994, as cited in Rach et al., 2013). The avoidance of the utilization of the benefits of negative knowledge gained from error situations stems from the potentially severe consequences to individuals and organizations that may arise as errors are made manifest (Keith & Frese, 2008). Therefore, professionals in general tend to

avoid errors in the first place (Keith & Frese, 2008). Because people are customarily taught from a positive knowledge standpoint it is through their individual error situations where they acquire negative knowledge (Oser & Spychiger, 2005; as cited in Rach et al., 2013). However, we can utilize the negative knowledge from others to avoid the same or similar deviations from optimal performance. Not only is it a step in the right direction to promote the detection of issues and issues correction within an error-tolerant environment, the benefits are magnified when analysis with the goal of prevention is an integral part of the process (Rach et al., 2013).

Keith and Frese (2008) illustrated the potentials of analyzing and embracing negative knowledge in a meta-analysis of empirical studies regarding training methods. Training methods that both encouraged active exploration and that encouraged participants to make errors via positive error management instructions were considered as part of the Error Management Training (EMT) category. Training participants in EMT were provided with positive statements such as “The more errors you make, the more you learn!” and “You made an error? Great! Because now you can learn something new!” (Keith & Frese, 2008, p. 60). EMT is based on the concept that errors are a natural consequence of learning and that errors possess information for the learner to better direct them to areas of need for further improvement. EMT methods were compared in terms of effectiveness against training methods that did not encourage errors during training or disregarded them altogether whether they be purely exploratory or purely procedural. The researchers found that EMT methods led to better training outcomes than the aforementioned alternative methods. Conventional tutorials, such as standard step-by-step procedural methods employed in most schools, fail to capitalize on the effective promotion of learning that deliberately incorporating error analysis can provide (Keith & Frese, 2008).

Rach et al. (2013) demonstrated that constructive error handling is a vital component for the promoting individual learning. The darkened areas in Figure 1 represent an important area of education research in terms of studying one-to-one initiatives.

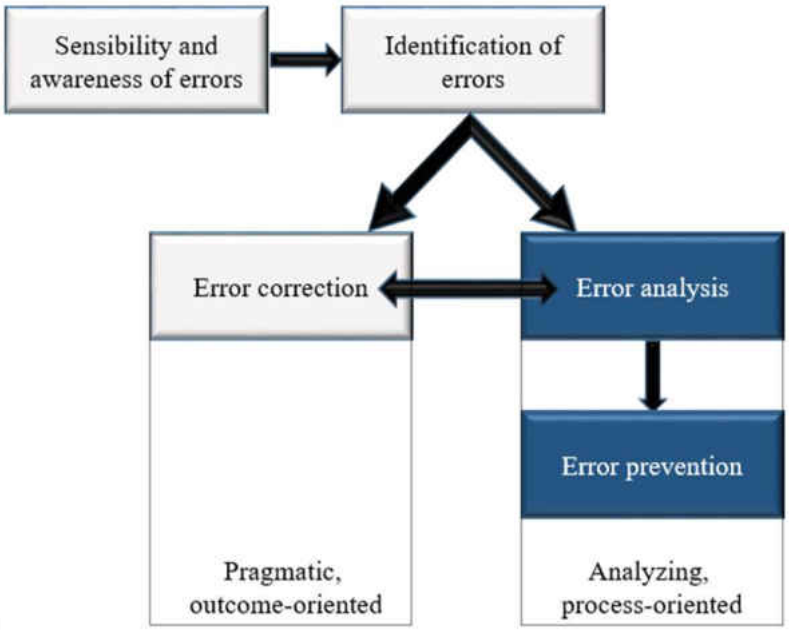

Figure 1. Process model for learning in error situations (Rach et al., 2013)

The researchers suggest through the use of this model that there needs to be a sensitivity or heightened awareness towards issues and their identification, leading to error analysis, and finally issue prevention. To analyze the potential errors properly there needs to be an in-depth, close-up examination of the actual issues that teachers face. This concept of the necessity and benefit of error analysis for the promotion of meaningful learning serves as the foundation for this present study. By first examining the issues that educators face in the implementation of one-to-one initiatives a better understanding of root causes and practical solutions can be discerned.

Barriers in One-to-One Computing

A thorough inquiry into one-to-one implementation issues as expressed by teachers can yield valuable results. Garthwait and Weller (2005) employed phenomenological enquiry

through observation and in-depth interviews. Their study has many similarities to this present one because of the attention paid to mistakes, challenges, and errors. Their findings include a detailed list of challenges that teachers were forced to deal with, often without any support. Perhaps greatest of these challenges were those regarding technical issues. One of the teachers in the study was reluctantly chosen to be the lead technology teacher and ended up not only struggling herself, she also had the task of helping other distressed teachers. In addition, attending numerous training sessions pulled her away from her regular duties. She discovered that the students also needed training with technology and she ended up losing instruction time to teach them computer skills. Furthermore, the school's Internet connection was only reliable in the morning and not the afternoon so lessons had to be adjusted with this consideration in mind (Garthwait & Weller, 2005).

While teachers struggled with these and other significant challenges the ones that resulted from school and district policies were even more troublesome. The district created technology use guidelines concerning things such as student e-mail, Web pages, proper handling of the laptops, and expectations. When a student had reached a specified number of infractions they were disconnected from the network (Garthwait & Weller, 2005). When this occurred teachers had to create an alternative lesson for disconnected students, thus vastly increasing teacher workload. The district also stated that laptops were not to be taken home until February, causing teachers to limit computer-based assignments to those that could be completed in class. The school ran out of ink midway through the year and even put printers in places where when students went to get their printouts they would congregate and be hidden from the teacher's view. Additionally, the district professional development was extremely lacking. One of the

teachers said that the best help she got all year was from the students, some of whom were light years ahead of her (Garthwait & Weller, 2005).

The literature is full of major challenges found in one-to-one environments and is still only scratching the surface. Student using iChat and passing what can be considered electronic notes in class was the dominant theme of the study conducted by Storz and Hoffman (2013). The findings demonstrated that providing students with laptops gives them increased responsibility and forces them to make the decision as to whether to stay on task or not when on the computers (Storz & Hoffman, 2013). While this issue of student off-task behavior through iChat, games, music, etc., was the by far the biggest challenge that teachers were facing, the school district in this particular study was basically unresponsive to the needs of the teachers (Storz & Hoffman, 2013). The professional development was primarily about interesting new apps or software programs when what teachers were really seeking was knowledge to improve their teaching practices instead of a demonstration on how to use Garage Band and iMovie (Storz & Hoffman, 2013).

Computers have the potential to cause distractions and difficulties equal to their power to transform teaching for the better (Dunleavy et al., 2007). Dunleavy et al. (2007) noted, "If the teacher does not have strong classroom management skills the computers simply add another layer of management complexity that is possibly overwhelming" (p. 449). Dunleavy et al. (2007), in a similar manner as Storz and Hoffman (2013) and Garthwait (2005), identified detailed challenges through a study involving students, teachers, and administrators at two middle schools. The researchers found issues that occurred across both sites and to some extent with all participants. Some of these are as follows:

- Teachers had to repeatedly instruct students to close their laptops when not using them for the lesson.
- Students forgot to bring their device to class.
- Students were without computers because of repair issues.
- Student arrived to class without fully charged laptop batteries (this was the most frequently observed challenge).
- Classrooms did not have well-placed electrical outlets.
- Students were often locked out of an entire lesson due to computer issues.

Introducing laptops into the classroom at the ratio of 1:1 presents a host of unique challenges that could be lessened with proper preparation and analysis. With the multitude of studies identifying challenges and difficulties there is an opportunity to elicit the root causes of these issues and prevent as many future errors as possible. While each individual program is distinct and so are the issues, important themes regarding challenges emerge from the literature. Hardware, software, professional development, classroom management, teacher consultation, off-task student behavior, Internet safety and responsibility, and the creation of a student-centered classroom, etc., are all areas where major work can be done.

Summary

A review of early groundbreaking initiatives demonstrates a pattern of expensive price tags and relatively modest gains (Bebell & Kay, 2010; Bebell & O'Dwyer, 2010; Shapley et al., 2010). However, it is also apparent that the trend to saturate schools with technology is not going to slow down, regardless of past successes and failures. A powerful lesson that can be generated from examining past trends in one-to-one initiatives is that positive results do not miraculously occur because access to technology has been increased (Weston & Bain, 2010). The quality of

the activities in which the technology is being utilized and the support structure in place to facilitate implementation has been shown to be more impactful than the quantity of technology (Cheema et al., 2013).

Rather than serving as the catalyst for instructional and structural change to teaching and learning, when technology is introduced into established educational systems it will most likely be used for traditional practices (Rosen & Beck-Hill, 2012). Weston et al. (2010) make the point that the new technologies merely tend to "automate the practices of the prevailing paradigm" (p. 10). Thrusting new technologies into a predominant model of instructionism does not automatically reshape how teachers and students function but instead may cause the technology to strengthen the current system (Halverson & Smith, 2010). Cuban (2001) states that even when computers are incorporated into the daily or weekly routine of teaching and learning they are often done so in a way that does not cause dramatic or substantial changes to decades old instructional practices. Cuban gives the example of kindergarten teachers studied at seven different sites who incorporated computers into the classroom. The computers were added to "the array of centers already in common use" (2001, p. 58). This is an example of teachers adapting an "innovation to existing ways of teaching and learning" while keeping the traditional structure unchanged (Cuban, 2001, p. 58). Cuban also reveals that in Silicon Valley, "the heartland of high-tech innovation," traditional teaching and learning dominated despite a relative abundance of available technology (2001, p. 93). Maximum access to technology without corresponding equivalent changes in "the structures and processes that have influenced both urban and suburban teaching practices for many decades, only minor alterations in classroom practices will occur" regardless of technological saturation and investment (Cuban, 2001, p. 181). That is precisely why scholarly research into the nature of how the technology is being used and

misused in relation to the promotional tactics that accompany its adoption is essential. Possessing a deeper understanding of the issues that lead to shortcomings in the initiative's policies or in teacher practices can help results match rhetoric.

These examples of previous research represent a sample of literature indicative of one of the major areas of scholarly research regarding one-to-one computing initiatives. Examinations into teacher attitudes, beliefs, and feelings highlight key areas from which to elicit responses from teachers. From these responses the opportunity exists to work backwards to identify issues that may impede successful implementation of the one-to-one initiative. Conditions such as lack of teacher involvement in planning, failure to differentiate professional development, inadequate reassurances of teacher concerns, misunderstanding of what a technology-conducive classroom looks like, and district policies that limit students' self-direction and independence, are potential implementation issues identified through prior research.

The aforementioned studies offer insight into the emerging trends and issues related to one-to-one initiatives and on some of the most significant programs. This present study differentiates itself from previous research by focusing primarily on identifying themes of issues within the classroom related to one-to-one initiatives and then tracking them back to policy and procedural decisions through interactive and multistep theme analysis with experts in the field. This study does not treat digital initiatives as a positive or negative development, instead it seeks to locate the issues that most restrict its successful implementation and use the knowledge gained from this analysis to limit future inefficiencies in the system.

People are often trained or instructed in the correct ways to do things. Traditional educational training and professional development tend to either purposely avoid the utilization of errors and negative knowledge or dismiss it out of a lack of understanding regarding its

potential benefits (Keith & Frese, 2008). However, this study will demonstrate that there is great value in warning how not to do something and in sharing the most pertinent mistakes. There exists a cumulative human experience regarding issues associated with one-to-one implementation that can be drawn upon to increase learning opportunities (Rach et al., 2013). One-to-one computing dates back approximately thirty years since its inception. There is wealth of knowledge gained from challenges, mistakes, and errors that can be transformed by qualitative researchers into a useful product. The methodology that follows this chapter explains in detail the processes followed to contribute to that goal.

CHAPTER 3

RESEARCH METHODOLOGY

Introduction

The purpose of this phenomenological study is to identify and analyze the process of implementing one-to-one computing initiatives. An understanding of the implementation process will be developed through the analysis of data collected in interviews with experts in the field who have worked with implementation of one-to-one programs. The basic principles of the expert elicitation process, which include the use of expert participants, several rounds of interviews, seeking consensus between rounds, multiple member checks, and extra time allotted for participant preparation, will be utilized throughout this study (Boring et al., 2005).

Research Questions

1. What are teacher concerns regarding issues that occur in the implementation of one-to-one initiatives?
2. What are teacher perceptions of how to improve policy and practice of one-to-one implementation?
3. How can the elicitation of knowledge gained from experiencing challenges in one-to-one implementation create opportunities to enhance student learning?

Qualitative Design

In qualitative research an inductive reasoning process occurs where data are gathered first, as opposed to the formulation of a hypothesis, then the information is synthesized to create generalizations (McMillan & Schumacher, 2010). In this study, generalizations form themes of educator input regarding their experience with one-to-one initiatives. The analysis of these themes by the participants can aid in the development of strategies for successful one-to-one

initiative implementation. The principles of expert elicitation, which generally involve multiple face-to-face and expert panel elicitations to arrive at solutions within a complex and uncertain environment, were taken into consideration in the design process (Ayyub, 2000; Boring et al., 2005; Morgan, 2014).

Role of the Researcher

The essence of phenomenological qualitative research is to study the phenomenon as the participants understand it (Patton, 2002). Participants' perceptions constitute the reality of what is being studied. While participants in this study will be asked to attribute causality to issues in implementing a one-to-one initiative, they may misidentify root causes due to their limited individual perspective. However, the aggregated data elicited from all participants can lead to a deeper and more accurate analysis than any single participant contribution. Therefore, issue analysis is used to probe beyond initial explanations to establish themes and to subsequently connect established themes to policy and procedural decisions. This methodological approach enhances the possibility of developing solutions that might otherwise remain diminished. In qualitative research the researcher becomes the instrument by spending time in close proximity with the setting, participants, and documents (McMillian & Schumacher, 2010). Patton refers to the middle ground in which qualitative researchers must operate in to ensure validity and authenticity as *empathic neutrality* (2002). The researcher remains neutral because they are not setting out to prove a particular perspective but rather to report conclusions based on evidence (Patton, 2002). The researcher in this study has emphasized trustworthiness and authenticity rather than objectivity since objectivity implies a single reality or truth while fairness accepts multiple truths and realities as valid (Patton, 2002).

The researcher is an employee at the school site where data collection is being conducted. For the last three years the researcher has worked as a teacher within this particular one-to-one computing environment. This experience has contributed to the managerial and technical knowledge necessary for executing the responsibilities involved in the execution of this study, including overseeing all participants and taking ownership for the results (Ayyub, 2000). In addition, the researcher has used his familiarity with one-to-one initiatives to understand the importance of eliciting from experts in the field information related to challenges and difficulties of one-to-one initiative implementation.

Ethics

Central to the expert elicitation process is the concept that participants are made aware in advance and throughout the study of the background material, issues, goals, progress, and other supporting documents (Ayyub, 2000; Boring, 2005). Therefore, all participants were provided with informed consent forms that outlined who was conducting the study, the goals, why the participants were chosen, the time commitment involved, benefits, risks, that their participation is voluntary and confidential, and compensation for the study (Rudenstam & Newton, 2001). The researcher respected and informed the individual participants of the right to withdraw from the study at any time and to strike from the record individual statements for whatever reason (Rudenstam & Newton, 2001). Multiple member checks were undertaken with the participants to remove any misconceptions or errors that may have emerged in either data collection or analysis.

IRB approval from East Tennessee State University was received prior to any part of the methodological procedures being initiated. There were nominal human safety concerns in this study.

Population and Setting

The population for this study is defined as teachers in one urban middle school located in the southeastern United States. Teachers at this school have various levels of experience implementing a district-wide K-12 one-to-one initiative. Excluded from the population were teachers who have no work experience in the implementation of a one-to-one computing initiative.

The setting for the research is a middle school with approximately 600 students and a faculty and staff of 50. The school's demographic makeup is 60% black, 25% white, 7% Hispanic, 3% Asian, and 5% other. Forty-five percent of the students are qualified for free and/or reduced lunch. The school is in the fourth year of a one-to-one initiative. A component of the initiative is that all middle and high school students receive a laptop computer and students in grades K-5 receive iPads. The middle school is located in an urban school district that has 21 elementary schools, 5 middle schools, 1 junior high, 7 high schools, 5 P-8 schools.

Sampling Strategy and Sample

The sampling strategy employed in this study was purposeful criterion sampling by case type based on participant case studies that were the most information rich (McMillian & Schumacher, 2010). Initially, experiential relevance of the participants was determined after a round of open sampling from those who agreed to an initial meeting (Rudenstam & Newton, 2001). Teachers currently teaching within the one-to-one program under study were purposely selected from three major and differing perspectives; those who were completing their first year of teaching, those who had between two and ten years of teaching experience, and those who had eleven plus years of total teaching experience. The reasoning behind selecting participants from these three groupings was to create a panel of experts that had a wide range of viewpoints,

expertise, technological exposure, and varying years of teaching experience within the organization, all of which are important for the elicitation process to be successful (Ayyub, 2000).

The issue of breadth versus depth was also considered in this qualitative design (Patton, 2002). Nine teachers were chosen for the interviews (three from every sampling criterion). As Ayyub et al. (2000) noted, "The size should be large enough to achieve a needed diversity of opinion, credibility, and result reliability" (p. 73). Nine participants provided data saturation for the establishment of strong themes while also preserving the ability to interview each participant in-depth for an extended period of time. Participants were selected for key case attributes related to digital one-to-one initiatives.

Data Sources

The data were collected from interviews with teachers who had varying levels of experience with one-to-one initiatives. Three rounds of interviewing occurred, resulting in a total of 27 face-to-face interviews with three intermediate member checks between interview rounds. Two school administrators were also interviewed as a means of triangulation and to provide information regarding district and school policies that apply to the one-to-one initiative. A document analysis was also performed relating to policies referenced in teacher interview data.

Data Collection and Analysis

Data was primarily collected through interviews. All interviews were tape recorded with the knowledge and consent of the participants to increase the fidelity (Rudenstam & Newton, 2001). A journal was kept to record researcher impressions and field notes. The first step in the data collection process was small group interviews. These were conducted in a conversational style format until the participants with the richest case studies could be selected. Selected

participants were included in three separate one-on-one, face-to-face interviews. All interviews throughout the process were recorded and transcribed and saved as part of the audit trail. Interview Round 1 began with an open-ended informal question regarding issues the teacher had encountered in their experience implementing the one-to-one initiative. Interview questions used in Round 2 and Round 3 were standardized open-ended questions that emerged from established themes. The goal was to establish themes in teachers' answers that could be assembled to create an accurate compilation of issues, causes, and solution themes related to the implementation of one-to-one initiatives. It is understood that qualitative research depends on an emergent design that can evolve during the study based on knowledge of people, places, and other collected data (McMillan & Schumacher, 2010). Therefore, the nature of the questions asked at each round of interviews were dependent on previous data categorization and member check responses.

Document analysis of school and district policies were conducted to determine outside influence on classroom implementation of the one-to-one initiative. As part of the data triangulation process, comparing documents outlining district policy in relation to teacher responses assisted in validating the findings.

This study draws on the principles of the expert elicitation process in the construct of the data collection process. Expert elicitation can be defined as "a formal process of obtaining information or answers to specific questions about certain issues that are needed to meet certain analytical objectives" (Ayyub, 2000, p. 35). It is used to gather knowledge in domains that involve significant uncertainty (Rai, 2013). Expert elicitation relies on the skill of the researcher to derive relevant information from participants that can be synthesized into themes that once assembled represent a product that is greater than the sum of its parts.

The first step in the process was to provide background material and supporting documents to the identified experts so that they could become familiar with the issues under study and increase their attention and sincerity levels (Ayyub, 2000; Boring, 2005). Individual face-to-face interviews with teachers were conducted as the second step in the data collection process. The goal was to identify issues in the implementation of their respective one-to-one computing initiative. This information served as the raw data for the creation of themes.

The formation of themes was conducted by examining the relevant summary responses of each participant and assigning each portion of their data to an emerging category. As subsequent participant response summaries were analyzed they either populated already existing categories, led to the creation of new ones, or served to diverge the already existent category into additional, further refined categories. Coding in this study is similar to that of the Instructional Rounds process where objective observations or evidence is organized into emergent categories, from categories to emergent themes, and from themes to suggestions on next levels of work or strategies (Meyer-Looze, 2014). Open coding was first done to assign an initial meaning and descriptive category to the selection of raw data. This was followed by axial coding in which patterns or themes emerged to form subcategories based on their relationship to each other. Lastly, selective coding was used to assign a common categorical heading to the relationships between teacher response data (Rudenstam & Newton, 2001).

Once the evidence from the first round of interviews was categorized participants were provided with a summary of the issue themes created by the researcher and asked to respond via e-mail before they were finalized. This procedure, referred to as *member checks*, helps to confirm the accuracy and credibility of the findings at each stage of the process and raises the role of the participants to that of co-researchers (Rudenstam & Newton, 2001). This step is

consistent with the expert elicitation process in which experts are regularly given the opportunity to modify the additional information received from the overall panel discussions (Boring, 2005). For the purpose of this study, themes were determined when four or more teachers had identified a similar issue. Issues that were shared by three or fewer teachers were still documented and included in the audit trail. When three or fewer teachers share an identified issue, cause, or solution, there is a good chance that someone in the group of experts will have solved or mitigated the issue sufficiently and therefore it most likely will not require continued analysis.

The second round of face-to-face interviews were conducted with the goal of cause analysis. From approved issue themes the goal was to elicit from the participants the roots of the problem and ascertain whether an error actually existed that caused or exacerbated the identified group issues. This began the process of tracing backwards from identification of issue and challenges to potential errors in policy or practice. The data from this round of interviews was further broken down into cause categories and eventually cause themes. However, these cause categories and themes were allowed to emerge naturally from the participants as opposed to being established by the researcher. The rational for this was that the cause themes were reliant on expert opinion rather than the researcher's predetermined assumptions. The participants were trusted with the knowledge to accurately attribute causes to issues they faced on a daily basis.

The third and final round of face-to-face interviews were conducted with the goal of arriving at a consensus on issue prevention strategies. Solution themes were created based off of four or more participants' common responses. The experience of two prior interview sessions improved the consensus for the third and final stage. Morgan (2014), writing on the use and abuse of expert elicitation, argues that the effectiveness of expert panels would be improved if prior to the attempt to reach a consensus the panel had first gone through a series of individual

elicitations. This final stage of the process further distinguishes this study from others on one-to-one initiatives in that the final product, elicited from the collective wisdom and negative knowledge of experts, is designed to prevent future costly issues in implementation. This is a process-driven methodology rather than an outcome-based design because the goal is not just to correct but also to use identified shortcomings to prevent future issues (Rach et al., 2013).

After the three rounds of interviews were complete, the researcher conducted a detailed document review. Documents involved in the review process pertained to school and district policies. The purpose of this document review was to compare district and school stated policies with the participants' interview responses as a means of data triangulation. This step helped confirm or disconfirm attributed implementation issue causation.

Upon completion the document analysis the researcher conducted two interviews with administrators. This was the last step in the data collection process. The reasoning for this was for the researcher to have adequate knowledge of the one-to-one initiative based off teacher interview data and document analysis. Administrators were then able to provide more relevant data in regards to specific teacher feedback and themes.

Breakdown of Major Steps in the Elicitation/Issues Analysis Process

1. Issue background material and purpose of study to participants at least one week prior to initial interviews.
2. Conduct initial round of face-to-face interviews with teachers. The goal of this first round of interviews is to identify as many issues as possible that teachers are facing or have overcome in their implementation of one-to-one computing.
3. Researcher categorizes raw data into issue themes.

4. Participants are provided with issue themes and allowed an opportunity to respond in writing with feedback.
5. Second round of face-to-face interviews are conducted with all participants with the goal of identifying and analyzing potential causes in policy or practice that led to the issue themes.
6. Participants are given information regarding cause theme analysis and allowed to provide feedback in writing.
7. Third and final round of face-to-face participant interviews are conducted with the goal of eliciting solution themes related to previously identified issue and cause themes.
8. Researcher distributes solution themes to participants and provides opportunity for final feedback.
9. Researcher reviews district and school policies to further inform the issues analysis process and provide triangulation of data.
10. Researcher interviews two administrators with experience and knowledge implementing the district's one-to-one initiative.

Measures of Rigor

Various techniques were employed by the researcher to ensure that this study was designed and conducted with the goal of quality. Quality in qualitative research is essential and when properly established can help bring clarity to a complex and confusing subject (Golafshani, 2003). In order for a study to convince the audience that it is "worth paying attention to" and "worth taking account of" trustworthiness must be established (Lincoln & Guba, 1985, p. 290).

The term trustworthiness is a general term representing concepts such as reliability, internal and external validity, and objectivity (Lincoln et al., 1985; Rudenstam et al., 2001).

The following techniques have been used in this study to enhance the trustworthiness of the results:

Member Checks

Member checks are perhaps the most important technique for establishing credibility in qualitative research (Lincoln & Guba, 1985). This is the process of returning to participants the interpretations formulated from the raw data as a means of confirming their accuracy and credibility (Rudenstam & Newton, 2001). In this study, member checks were conducted after each round of interviews. The intent of these post interview member checks was to establish issue, cause, and solution themes respectively in interview rounds 1-3.

Lincoln & Guba (1985) noted that member checks can serve a number of important purposes. Member checks provide for the opportunity to intentionally assess, allowing participants a chance to correct factual errors and assess researcher interpretations. Member checks grant participants an opportunity to volunteer additional information. The validity of the data is enhanced as participants are recorded as having agreed to the accuracy of the researcher's interpretations. Member checks also provide an opportunity to summarize the findings at various important stages.

Member checks ensure that there is enough accuracy and strong enough themes to successfully progress to the next stage in the procedure. The member checks were conducted in writing through e-mail so as to give the interviewees time to reflect. Conducting the member checks anonymously through e-mail saved time and established a written record of interaction.

Triangulation

Triangulation refers to acquisition of data from various sources as means of authenticating evidence (Rudenstam & Newton, 2001). Research is strengthened through the combination of several methods (Patton, 2001). Triangulation within this study is achieved primarily through two types of techniques; the use of multiple and different sources, and different data collection methods (Denzin, 1978; as cited in Lincoln & Guba, 1985).

Multiple and Different Sources. Teacher interviews were the primary source of information. However, teachers' views of district and school policy were compared to relevant policy documents and through interviews with knowledgeable school administrators.

Methods. Different data collection methods were used in this study. The primary method used was interviews. Secondly, participants were asked through writing to respond to the data analysis conducted at each stage of the process by the researcher.

Peer Debriefing

From the outset of this study the researcher has made use of a knowledgeable and disinterested peer debriefer with expertise in the elicitation process. Lincoln and Guba (1985) write that the task of the debriefer is to interact with the researcher in an ongoing analytic session to ensure that they are aware as possible about the process and possible directions it may take. Using a peer debriefer throughout the study design and implementation benefits the researcher by "clearing their mind of emotions and feelings that may be clouding good judgement or preventing the emergence of sensible next steps" (Lincoln & Guba, 1985, p. 308).

Purposeful Sampling

Purposeful sampling was used in this study to select information rich case studies that would lead to the greatest variation from the sample (Patton, 2002). Nine teachers were selected

for interviews using a maximum variation strategy across three one-to-one experience levels. Three participants were chosen who were completing their first year of teaching, three who had between two and ten years of teaching experience, and three who had eleven plus years of total teaching experience. Maximum variation sampling strengthens emergent themes since commonalities between groups are more likely to represent core issues related to the one-to-one initiative (Patton, 2002).

Prolonged Engagement

Prolonged engagement can be defined as "the investment of sufficient time to achieve certain purposes" such as learning about the culture under study and building trust (Lincoln & Guba, 1985, p. 301). The researcher in this study is an employee of the district under study and understands the culture as well as has a strong level of trust with regards to the participants. While experience within the school setting prior to the study strengthens the ease of navigating within it, identifying information-rich case studies, and establishing trust, it also comes with drawbacks that are noted in the section on bias.

Audit Trail

An audit trail was used in this study. It focuses on data in the form of tape recorded interviews, data reduction analysis and products, data reconstruction and synthesis products, process notes, peer debriefing notes, and consent forms (Lincoln & Guba, 1985). Koch (2006) argued that the trustworthiness of a study can be enhanced if the reader is able to audit the data, influences, and actions of the researcher (as cited in Carcary, 2009).

Bias

The goal of the researcher was to use his knowledge of the system under study as a means to enhance the data collection efficiency and accuracy. However, experience within the

system and with one-to-one computing on the part of researcher necessitates extra care towards objectivity. Patton (2002) refers to the middle ground in which qualitative researcher must operate in to ensure validity and authenticity as "empathic neutrality" (p. 49). The researcher remains neutral because they are not setting out to prove a particular perspective but rather to report conclusions based on evidence (Patton, 2002). Carefully designed open-ended questions were used by the researcher as a means of discovering more accurately the experiences of the interviewees as opposed to close-ended questions that may serve to confirm researcher opinions (Chenail, 2011). The researcher furnished a detailed description of the study's goals and expectations to participants prior to interviews to help limit bias and guide proceedings along an established methodology. Also, it was stressed to participants that all responses would be strictly confidential, not only to outsiders but also within the expert panel. The researcher understands the importance of documenting the one-to-one initiative conditions as the participants see it and to recognize useful data in each of their responses regardless of his own experience working with one-to-one initiatives.

CHAPTER 4

DATA ANALYSIS

Introduction

The purpose of this phenomenological study was to identify and analyze the process of implementing one-to-one computing initiatives. An understanding of the implementation process was developed through the analysis of data collected in interviews with experts in the field who have worked with implementation of one-to-one programs. The basic principles of the expert elicitation process were utilized throughout this study such as expert participants, several rounds of interviews, seeking consensus between rounds, multiple member checks, and extra time allotted for participant preparation (Boring et al., 2005) Nine teachers with varying levels of experience in the implementation of a one-to-one initiative took part in three rounds of individual interviews. Interviews were to establish themes of issues, causes, and solutions. Round 1 of teacher interviews centered on eliciting issues participants were encountering in their implementation of the one-to-one initiative. Round 2 utilized issue themes ascertained in Round 1 to establish cause themes. In Round 3, cause themes were analyzed to arrive at solution themes. The findings were then triangulated through a district policy analysis and through two interviews with school administration.

In this chapter the findings, in the form of issue, cause, and solution themes, will be presented as well as data gathered from policy analysis and administrator interviews. An explanation of the theme creation process and general data collection and analysis protocols will also be described. Each of the themes will be expounded and supported by participant responses.

Summary of Participants

This study's participants were composed of teachers and administrators in one urban middle school located in the southeastern United States. The setting for the research was a middle school with approximately 600 students and a faculty and staff of 50. The school's demographic makeup is 60% black, 25% white, 7% Hispanic, 3% Asian, and 5% other. The school is in the fourth year of a one-to-one initiative that provides laptop computers to all middle and high school students and iPads for all K-5 students. The teacher participants were chosen using a maximum variation strategy across three experience levels. Three groups were created, each with three teacher participants. Group 1 contained three first year teachers. Group 2 was composed of teachers whose total classroom experience ranged between two and ten years. Group 3 was composed of teachers with eleven years or more of classroom experience. The average age for Group 1 participants was approximately 34 years, 39 years for Group 2, and 53 years for Group 3. The subjects taught by these participants were wide ranging and were composed of math, art, music, special education, foreign language, and science.

Data Collection and Theme Analysis

The data collection process was composed primarily of interpreting and converging raw data from interviews into themes. In this study an inductive reasoning process was employed where data was first gathered, as opposed to the formulation of a hypothesis, and then synthesized to create generalizations or themes (McMillan & Schumacher, 2010). The nature of the questions asked at each round of the interview process were dependent on previous data convergence and member check responses. All interviews were tape recorded with the knowledge and consent of the participants to increase the fidelity along with a journal to record

impressions (Rudenstam & Newton, 2001). All interviews throughout the process were transcribed and saved as part of the audit trail.

Round 1 began with an open-ended informal question regarding issues the teacher had encountered in their experience implementing the one-to-one initiative. Interview questions used in Rounds 2 and 3 were standardized open-ended questions that emerged from established themes. For each round the raw interview data for each participant was interpreted and summarized by the researcher to extract the relevant information. In Round 1 the relevant information constituted participant responses that communicated issues in implementation of the one-to-one initiative. In Round 2 the relevant information extracted by the researcher from the raw responses were data that communicated various causes pertaining to Round 1 issue themes. In Round 3 the researcher summarized from the participant responses solutions to causes established in Round 2. Once the responses for each participant were summarized the researcher then focused primarily on this refined set of data to create issue, cause, and solution themes after each round.

Theme creation was conducted by examining relevant summary responses of each participant and assigning portions of their data to an emerging category. As subsequent participant response summaries were analyzed they either populated already existing categories, led to the creation of new ones, or served to diverge the already existent category into additional, further refined categories. This first step in the coding or theme process was described by Guba (1978) as the challenge of *convergence*, meaning to look for recurring themes in the data. During this step in the theme creation process the researcher did not assign category headings but instead grouped data by similarities and let the general theme headings emerge that supported the most relevant grouped data. Emergent categories were judged by two criteria: internal homogeneity

and external heterogeneity (Patton, 2002). Internal homogeneity is concerned with the extent to which data fits together in an emergent category or diverges into an additional category. External heterogeneity is concerned with the contrast between established categories to the extent that they are distinct and clear from one another (Patton, 2002).

As the data was categorized many themes emerged. However, for the data in this study to justify a theme that would be promoted to the next round of interviews, four or more participants were required to have contributed responses that led to the theme. The reasoning behind the response requirement being set at four teachers or more who shared similar responses was twofold. First, when at least four teachers' responses constituted a theme it ensured that the theme would be spread across at least two experience levels. Because each experience level included three participants, the theme qualification of four respondents reduced the likelihood that the theme was dependent on teacher experience and not on inherent characteristics of the one-to-one initiative. Secondly, when four of the nine teachers contributed to a theme the researcher, based on his own judgement and experience, determined that the theme was significant enough to justify promotion to subsequent rounds. As Patton (2002, p. 467) explains, "Since qualitative analysts do not have statistical tests to tell them when an observation or theme is significant, they must rely first on their own intelligence, experience, and judgement."

Final themes after each round of interviews were sent to participants to allow an additional opportunity to comment on the researcher's analysis. These member checks helped to validate the themes and ensure that they embodied a strong foundation to build the next round of research upon.

Round 1 Issue Theme Analysis

The goal of the first round of interviews was to elicit from each teacher participant numerous issues they have encountered in their implementation of the one-to-one initiative. The interviews were conducted in an informal open-ended manner so that the respondents' issues, free of researcher influence, would serve as the base level from which to construct subsequent research. Patton (2002) states that qualitative interviewing begins by valuing the perspective of the participants as meaningful, knowable, and explainable. Trust in the teachers' ability to identify and articulate important issues explains the decision to ask only one scripted question to all participants in Round 1: "What are some of the most significant issues you have encountered in your implementation of your district's one-to-one initiative?" Participants were free to offer as many or as few issues as they felt were pertinent. The interviews were transcribed, analyzed, and summarized so that each issue could be extracted from the raw data. A total of seven themes emerged from Round 1 due to their agreement between four or more of the nine teacher participants. These issue themes were sent to all participants as part of the member check process.

Table 1. illustrates the frequency that teacher responses contributed to Round 1 issue themes. An X under the participant's number indicates that the issue to the far left was communicated by them during the Round 1 interview. Each of the issue themes summarized in the chart are explained in further detail below along with a sample of teacher responses that contributed to the theme.

Table 1.

Breakdown of Summarized Participant Responses Contributing to Round 1 Issue Themes

	Group 1: 1st Year Teachers			Group 2: 2-10 Yrs. Exp.			Group 3: 11+ Yrs. Exp.			
	P.1	P.2	P.3	P.4	P.5	P.6	P.7	P.8	P.9	Total
Inappropriate student computer usage	x	x	x	x	x	x	x	x	x	9
Difficulty monitoring student computer use	x	x	x	x	x	x	x	x		8
Ineffective teacher tech training programs	x	x	x		x	x	x	x		7
Ineffective disciplinary policies		x	x	x		x	x	x		6
Unreliable computer based testing	x		x		x	x	x		x	6
Exclusive use of digital curriculum				x	x	x	x		x	5
Insufficient tech support	x	x	x				x	x		5
Total common issues for each teacher	5	5	6	4	5	6	7	5	3	

Note. P.1-P.9 refers to Teacher Participants

Issue Theme 1: Inappropriate Student Computer Use

Each of the nine teachers provided Round 1 interview data supporting an implementation issue of dealing with students using their laptops for unauthorized and inappropriate uses. While collecting issue data the researcher made a conscious effort to avoid influencing the participants to veer into the causation thought process since there may be numerous contributing factors of inappropriate computer use on the part of students that deserved its own analysis in Round 2. Playing games, looking at pornography, downloading unauthorized apps, chatting with friends, shopping, and watching movies, were some of the major specifics stated by teachers under this theme heading. One of the teachers, P.4, stated,

> I mean I've caught kids, like I've caught kids on porn in my class before and not felt like that was ever handled properly. And I mean it's things like that. These are twelve-year-olds and they have complete access to everything. And you know some things are

> blocked but I mean I caught a kid in after school tutoring. He was on the bus, because they have Wi-Fi on the buses, and he was looking at naked girls in the shower.

Another teacher, P.8, communicating frustration with the level of game playing on the computers during instructional time stated,

> I just completely shut them down. Some kids I shut them down three or four times in a class period. I'm not going to keep singing to them. I'm not going to say get off the games. I'm just going to shut them down.

P.2 also commented on the difficulty of keeping kids from playing games and veering off task:

> The students find the monitoring software almost like a task to go around what I've set up. They are more concerned with figuring out how to do what they want to do rather than the assignment, and games, and movies… They are playing games. Math IXL is another one. The kids think it's OK to do other schoolwork and not focus on mine.

Playing games and using the computer inappropriately, according to P.5, had reached a level where the students felt entitled to use the computers as they wished:

> Another issue that we have with the classroom is the kids get distracted by the computers. They would rather play games on there to a point where they're pretending that they're taking notes or doing what you ask them do and you look and they're doing something they shouldn't… It has almost gone off the deep end to the point where the kids feel they are entitled to play games during class.

Similarly, a first year teacher, P.1, sophisticated in his/her own technology skills said,

> I could see games. You know? I could see things that I knew were not approved, websites, and they were somehow getting around filters. They were using hot spots. They

were using proxies. I mean these kids know more about technology that we thought they ever could at this age.

Issue Theme 2: Difficulty Monitoring Student Computer Use

Teachers have difficulty monitoring and controlling student computer use. This issue theme is closely related to Issue Theme 1 but is distinct in that it is concerned not with what the students are doing but the ability to ascertain their behaviors, appropriate or not, while using the laptops. Eight of the nine teachers felt this was an issue worth mentioning. The one teacher that did not mention it as an issue taught special education classes of ten or fewer students. The central issue was related to the district-provided computer monitoring software, DyKnow. In theory, DyKnow allows teachers to watch all of the students' computer screens simultaneously in real-time from their teacher laptop. However, DyKnow, even when it was working properly, was seen by the teachers as insufficient. Teachers stated that students could find ways around DyKnow such as putting their computer in airplane mode, using a personal hotspot Wi-Fi connection, and playing games and watching movies offline with a thumb drive. P.2 stated that, "Probably with DyKnow, you know it's supposed to be an aid in helping us like monitoring the students with their one-on-one use. The thing is, I end up having issues with DyKnow blocking the websites I need." In addition, several students were registered onto the DyKnow program late by the district or were issued loaner computers that DyKnow could not access. In reference to this aspect of the monitoring issue P.6 stated,

> The other issue with DyKnow is that some of the kids when their computer is turned in because it needs repair or whatever and they're issued a loaner I don't have any control over that loaner. So that's a problem because usually those kids who are having problems with their computers are the ones who are off task the most.

During testing windows, lasting approximately two to three weeks at a time, DyKnow was turned off by the district, making it unreliable:

> It's not working. It well, it's not working right now because they disabled it for testing. But we've had so many errors. Kids, they've found ways to keep their screens from showing up. So you know you still don't know what they're doing and you can't shut them down because they don't appear (P.5).

Another teacher, P.7, voiced frustration over DyKnow's ineffectiveness coupled with instructional mandates such as keeping students in small groups, walking around the room, and monitoring student computer use from a central location:

> You cannot monitor everybody when you are working with one group and you have everybody doing something different. It's very difficult even though you have DyKnow and supposedly you have things that ought to be blocked but students are smart enough to find ways around that regardless of what you do.

Issue Theme 3: Ineffective Teacher Training Programs

Seven of the nine teachers contributed data that led to the theme of ineffective training programs, including all three of the first year teachers who generally undergo the most training when entering a new school or district. Teachers commented that district and school-based training does not prepare teachers in an effective and ongoing manner. District led training tended to be a one-size-fits-all large group session done early in the school year without additional support. P.8 voiced this issue by stating,

> They were very liberal in offering the training but the problem was I didn't ever have time to. There were follow-ups to use it but there wasn't an actual time to sit down and

one on one and learn how to use it. For example, I might have a half day workshop and they will go through a program and say 'OK, this is how you do it and that's the end.'

Teachers remarked that the training lacked relevance, was basic, and was not differentiated according to individual teacher needs. Participant 3 stated, "The bottom line is teachers do not get enough training for all the programs that we are supposed to be using. P. 1 also contributed to this issue theme:

> I never got official training in iNow, ever. I figured it all out. And I've now just started to figure out things that make my life 100% easier. It's within the last three weeks of school and I'm learning new things about iNow. But you know, I was never given that mentor teacher and I found it on my own. But we were given that sort of orientation training in July with the new teacher orientation. They spent a whole lot more time on things that I did not use like Weebly and there are some other ones that you know like Socrative, things like that, that I don't really use all that much.

P.6, voiced similar concerns as P.1, that limited and ineffective training was offered early in the year and subsequently neither expanded upon or improved. The Researcher asked P.6, "Is the district offering you any kind of training to be able to stop the kids from doing these things? Is there any ongoing training on DyKnow or anything else?" P.6 offered the following response,

> Not that I know of, no. They offered a little bit of DyKnow training as kind of a small thing during your planning period at the beginning of this year but lots of times the questions I was asking, the answer was, 'I don't know. We will have to get back to you on that.' So it's a situation where the central office doesn't really know what the real problems are that we're experiencing in the classroom.

Issue Theme 4: Ineffective Disciplinary Policies

Six of the nine teachers, two from each experience group, stated that district and school behavioral policies did not support teachers in their behavior management as it relates to one-to-one initiative implementation. Weak an unenforced behavioral policies emboldened increased student discipline problems according to the teachers:

> I think that punishment for technology infractions is ridiculous, not as strict as it should be when you have one-to-one computers. I think that if it was more strict then we would not have as many issues and I wouldn't need to monitor on DyKnow as much as I do if people were punished accordingly or disciplined (P. 2).

These sentiments regarding disciplinary problems and lack of enforcement were shared by P.3:

> Also that they don't get the discipline as a response to their lack of discipline. So I don't like to use the word punishment but that's only how I associate, or consequences, better word. Consequences for their inappropriate actions of computer use. So it is the two parts, that they don't have proper discipline on how to use it and then they don't get the appropriate consequence discipline applied to them to teach them that they have used the computers inappropriately. That it's a tool given to them that is supposed to be beneficial but they turn around and make it a negative issue. So that has been a frustrating problem.

For P.8, the overreliance on phone calls to parents, tracking each disciplinary action in a behavior log book, and each phone call in a call log, was time consuming and ineffective. P.8 stated,

> I spend a lot of time, not as much as I used to, but calling parents and calling the same parents. That’s another thing that takes a whole lot of time. And then I’ll find that I forget to write something. I either forgot the behavior log or I forgot to go and to put it in the

call log. There are just so many different steps… I always forget something because it's too much. For one thing you've got to do four different things [to document behavior] That's too much.

P.4 was asked about the disciplinary policies related to student game playing. P.4 responded,

> I don't think that there are any. I mean once, once in the fall or maybe twice IT said we're going to sweep the computers. This is the first school I've ever heard doing that. So the kids, you know, deleted it or put it on a thumb drive for a week and then it's all back up. And then you know, I don't play computer games so I don't know how to install their stuff and they can pretend that it's uninstalled.

Issue Theme 5: Unreliable Computer-Based Testing

Six of nine teachers stated that they had issues regarding students experiencing standardized testing irregularities via computer-based testing that negatively impact their performance. As a result of the one-to-one initiative all standardized tests are given on student computers. Issues such as questions not loading, students getting repeatedly booted from tests, laptop and platform compatibility issues, and teacher and student frustration, were all mentioned in relation to this theme:

> It's easier for some of the students actually take it from a textbook than from the computer. The computer has frustrated the students sometimes when it kicks them out for testing and it keeps them out of their assignments, especially if they have to start over. It already takes a long time for our kids to complete assignments in a timely manner. So when the computer does that it makes it very, very, frustrating (P.9).

P.7 shared similar frustration for testing issues related to one-to-one computer use, especially when it relates to high stakes standardized tests:

> Testing for the ACT Aspire was a nightmare in my opinion. The page would freeze. The children would get booted out so that you would then have to go to the main teacher's computer and reopen it for the student. And if the student didn't know how to listen they keep clicking on it and kick themselves back out… I saw a lot of frustration. And you just tell'em it's going to be OK, go on, and pray they don't lose time or anything because supposedly they were not supposed to. But you know you really can't guarantee anything on that. The End of Course test, we need to talk about that. That testing was a nightmare and I really feel bad for the children. Because you know all year long you talk about how important this test is going to be. They prepare all year long, get in the test, and the question might not pop up or one answer won't show up or two answers I saw a couple times wouldn't show up. And you feel bad for the student.

P.3 also shared observations related to testing difficulties. Students were repeatedly exited out of the testing platform during standardized testing. Teachers were forced to problem solve as the exam was being administered as to what things were responsible for student testing malfunctions. P.3 stated,

> Some of the students were getting knocked out. But just with anything there was trickling information. I found out that it worked better if they were using Firefox. All teachers we were supposed to be using Firefox not Internet Explorer or Chrome. And what else? Oh, that they couldn't have screen savers or any programs in the background. But the screen saver, that one was something that I found out like at the last minute. So those were glitches. I constantly did have to restart. You had to restart the exam, restart the exam, and restart the exam because it exited students out of the testing. But by the third day, by the fourth day, we were good to go.

P.1 limited testing issues by administering practice tests in the week before the testing window opened. Despite fixing his/her own testing issues, P.1 spent most of the week assisting other teachers and students with their testing issues:

> I heard some of the people's stories from their rooms. I didn't have much trouble as they did. The initial process of checking all the students' computers and having them do the practice tests really, really helped. I think I got out a lot of the kinks. Because if we had not done practices on Wednesday and Friday the week before it would have been a nightmare Monday. So I only had one student who really had issues. But you know most of my job that week was resetting the test because people got kicked out for whatever reason. You know that the computer would kick them out or TestNav would kick them out.

Issue Theme 6: Exclusive Use of Digital Curriculum

Reliance on online digital textbooks and curriculum presents accessibility and reliability issues for students, teachers, and parents, according to five of the nine teacher participants interviewed in Round 1. With the adoption of the one-to-one initiative most of the school's paper textbooks were removed and the ones remaining were not aligned with the new online curriculum. The move to rely exclusively on a digital curriculum presented issues for teachers that they did not encounter with paper versions. Also important to note is that none of the three first year teachers contributed to this issue, perhaps because they had no previous experience to compare with. P.9 stated,

> I think the main issues that I've had… is the fact that the laptops, using the one-to-one initiative hinder some of our student success. They actually need a textbook to help with the reading. We have students who can't watch the screens for too long or it will cause

them to stem. They don't focus as well as they need to. I do think it is a good tool for working on skills but I do not think it should be the main tool for all students.

Exclusive use of a digital curriculum also led to issues in terms of reliability. When there is Internet or computer problems access to the textbook is essentially blocked. P.5 stated,

> Our resources are only on the Internet. So if the Internet goes down you start scrambling for a backup plan. I have workbooks and other things and I can usually make up problems off the top of my head so I'm not too derailed by it, but it is annoying.

Similar to the feedback from P.5, P.6 also shared issues he/she had encountered with accessing the course materials when Internet connectivity was down:

> So you take a lot of time with teaching them how to use Edmodo, how to go to places on Schoolnet, how to access the place where the digital version of the textbook was. And we didn't, if I remember correctly, I don't even think, the first year we did not even have a file. You know, just a reference file of the textbook. We did not have an offline version of the textbook for the kids to use. So if they had no Internet we were just up the creek. And I had some very dedicated students who would go and sit in the parking lot of McDonalds so they could tap into their free Wi-Fi and get their homework done. You know and so we were having to deal with that.

Besides issues of student preference and reliability one teacher also added that with the use of the digital curriculum students have found ways to get credit for doing homework without actually doing the assignment. One teacher, P.4, commented,

> I just get a grade and I never see, unless I have them turn their scratch work into me, what they're missing and why or what their mistakes are. So I think that's been an issue for me, having to make that adjustment to turn their numbers and show me or scratch work. I like

> that the software gives them the opportunity to see how you do it and it lets them view an example or it can walk them through a problem they're struggling with. But, just like the kids can find proxies and ways to get around them, you know to hide things, they also have figured out how to look at the answers. Back, back, back, and they can get a hundred without ever having tried or actually read any of the problems.

Issue Theme 7: Insufficient Tech Support

Five of nine teachers commented that district and school-based tech support was slow, limited, and generally unresponsive to teacher needs, forcing teachers to solve their own tech issues. P.2, speaking of slow tech support to assist with student DyKnow registration said,

> It was an issue going to Help Desk, going to IT, and going to Help Desk. Then Help Desk called me to get information from me and then it was a kind of waiting game… and it was probably a week and a half.

P.3 had similar issues with slow tech support to the point where contacting them at all was not worth the trouble:

> Just like it was at the beginning of the school year to get my projector to even work properly. That took months. And Mr. X came into my classroom to help me and we tied it up with rubber bands to the ceiling and moved it up and down, and just basically teaching me how to use the projector. It took months just to get an actual technician. So my experience was like forget about it because they're going to take months and before they come around maybe I can turn around and find somebody that can help me. But like I said, I figured out that the best solution was not let them get on the computers because I just didn't want the headaches.

P.7, who had over a decade of teaching experience, found the struggles with technology and the lack of technology support negatively impacting his/her ability to manage the classroom:

> Digits [math program] would not work. It wouldn't open up. Or if you got it to open up I could not get it to connect to the Lenovo because we are using the wireless router box. So there were always issues. And if that didn't turn out right the Promethean went out a couple times. So it was totally, no matter what you tried to do and taking steps forward, you felt like you were always moving backwards with that. So Digits was one of the first things. Then in October we were introduced to a program to help the students who did not score well or scored in the red and the yellow on the STAR testing.… It would not work. If one teacher was on it, it would kick the other teachers off of it while you were trying to put your students in. Even that software still did not work right. And I would often be advised to use it but was never really trained properly on it. The support is not there.

P.1 voiced concerns over the time consuming task of going through district IT personnel to install beneficial educational programs to the teacher and student school issued laptops. P.1 stated that school based IT staff are not permitted to authorize programs, which would provide welcomed support for educators:

> Teachers need to have more control over what's on their computers. I shouldn't have to go through IT just to update a certain program… It asks for administrator login. I can't. The local IT doesn't even have that. You know we have to go through X and her department to be able to install any unapproved applications. There are numerous applications that would be beneficial for me as a music teacher… Most of them I can't access because it's blocked. So I guess just giving the teachers a little more control…

Because you know, if you could appoint one or two people or at least let the local IT be able to install programs, I think that would be nice at least.

Round 2 Cause Theme Analysis

In Round 2 interviews, issue themes were utilized as framework to elicit from teachers the root causes of previously identified themes. Each issue theme was read to the participant. They were then asked what they thought might be a causal factor. The researcher also informed each participant that the issue themes may not have been ones that the individual teacher contributed. Therefore, they could skip the question or choose to offer a cause or causes that were responsible for the identified issue. Questions were asked by the researcher in the following manner, "In Round 1 Inappropriate computer usage was determined to be an issue theme. Teachers stated that students use their computers for unauthorized activities such as visiting inappropriate websites, playing games, chatting, etc. What do you think is causing this?"

Generally, teachers chose to offer multiple causes for each issue theme. The inappropriate computer use theme elicited cause responses such as teachers not having proper training to stop students, lax consequences, students being unaware of appropriate behavior, faulty monitoring software, and students not being mature enough. After the researcher had interviewed all nine teachers he then took the causes and created cause themes in the same manner as was done in the creation of issue themes. The raw interview data from Round 2 was analyzed and the relevant cause material was extracted and summarized for each of the participants. The summarized and refined data was then assigned to emergent categories until the main cause themes could be formed.

Once the Round 2 cause data was obtained the new information was treated independently of Round 1 issue data. The disassociation of causes with specific issues was vital

to the creation of the cause themes since one particular cause need only be counted one time for each participant regardless of how many times it was offered or for what specific issue or issues it was originally intended. This decoupling, and the creation of cause themes independent of specific Round 1 issues, allowed the causes and eventual solutions to potentially represent multiple issues. Therefore, a pyramidal trickle-down effect can occur in which eventual solutions to causes can have the greatest impact in effecting positive change in relation to Round 1 issues.

The causes themes that had at least four teachers contributing to them are listed below in Table 2. Each of the eight cause themes are explained in detail with representative supporting participant quotes provided.

Table 2.

Breakdown of Summarized Participant Responses Contributing to Round 2 Cause Themes

	Group 1: 1st Year Teachers			Group 2: 2-10 Yrs. Exp.			Group 3: 11+ Yrs. Exp.			
	P.1	P.2	P.3	P.4	P.5	P.6	P.7	P.8	P.9	Total
Admin is reactive – does not troubleshoot/anticipate issues ahead of time	x	x	x	x	x	x	x	x	x	9
Lax consequences for behavior and computer use agreement infractions	x	x	x	x	x	x	x	x	x	9
Training programs not teacher-centered	x	x	x	x	x	x	x	x	x	9
Students lack training in digital citizenship	x		x	x	x	x	x	x	x	8
Tech support is understaffed, overworked, and lacks support from central administration	x	x	x	x	x	x	x		x	8
Top-down district control and loss of teacher autonomy	x	x		x	x	x	x	x	x	8
High turnover rates	x	x	x		x	x			x	6
Training staff and IT personnel not familiar with classroom issues		x		x		x	x		x	5
Totals common causes for each teacher	7	7	6	7	7	8	7	5	8	

Note. P.1-P.9 refers to Teacher Participants

Cause Theme 1: Administration is Reactive and Rushes Implementation

All of the nine teachers interviewed contributed to Cause Theme 1 which states that the administration is reactive and rushes implementation. This is a complex cause theme covering a lack of troubleshooting, vetting, adequate transition time, and attention to limiting long-term issues as they relate to the one-to-one initiative. P.1 stated,

> One thing I've kind of noticed is administration or teachers or even downtown they're somewhat reactive in their problem solving. Like if we say OK we have ten teachers absent today, OK well let's just fix that for today. I don't feel like there is any solid plan that will work for the whole year. They just say today we have this and this. This is how we fix it today.

Teachers felt apprehensive about using new curriculum and testing platforms because often times the glitches had not been properly worked out prior to large-scale implementation. The statement from P.5 is indicative or that sentiment, "Some of the testing programs have not been vetted enough. I know we had that problem with Quality Core. They used a new platform they had not vetted near enough and it was a disaster."

P. 7 similarly stated,

> The root cause of the students not being able to use computer based testing is the school system decides to buy something and they really do not investigate it well. If somebody says it's the best thing since sliced bread the district jumps upon it without really investigating it.

Teachers also felt that the district administration's limited troubleshooting in advance of implementation caused an increase in issues. P. 9 commented, "To me what is being done is they wait until the last minute to maybe anticipate these issues. They wait too late and I think they are

overwhelmed downtown in that office." Stated in another way, P.6 replied, "They (students) are sharing with each other and they're ahead of us. We're playing keep up. We're in react-mode"

Partly due to the fact that teachers and administration were overwhelmed with new time consuming challenges the central administration did not phase-in programs and provide teachers time to build confidence and proficiency. To this aspect of the theme P.1 stated,

> Downtown, they are juggling a lot of plates and I don't even want to speak to what they are going through, but it seems like when they make decisions they just make blanket decisions and then expect it to be just like a switch and that it just happens.

Cause Theme 2: Lax Consequences

Nine out of nine teachers attributed one or more of the issue themes identified in Round 1 to lax consequences for student misbehavior as it related to general conduct as well as to computer use agreement violations. This is the first year that the school district has instituted a new behavioral policy. It was created in collaboration with the US Department of Justice as part of a deal to close a desegregation lawsuit. P.9 offered the following:

> Teachers do not have the back-up and they do not have adequate support when it comes to discipline in the classroom. For one, the Behavior Policy had to change because of the DOJ. It was watered down next to nothing. Teachers are in fear of their jobs and do not write up students like they should be written up. We should come to a point in this district like we had years ago.

Teachers voiced concern that the lenient consequences for initial offense emboldened student misbehavior. Students, under the new policy, are allowed multiple warnings, calls home, silent lunches, and other such consequences before they are removed from the class for any length of time and before school administration gets involved. Weeks of misbehavior, to the

point of shutting down the ability of the teacher to conduct class, are tolerated as teachers must seek alternative measures of discipline that do not involve outside assistance or students missing any instructional time. Teachers shared some of the following comments in relation to this cause theme:

> P.5: The Behavior Policy really does dictate how much they feel they are allowed to get away with. When we have stronger consequences they are less inclined to do things they are not supposed to or if they are going on distractors at least make sure they are legal ones.
>
> P.9: For a lot of our students those computers mean absolutely nothing to them. They haven't had to really pay for different things like chargers and bags and straps where at other schools in order to get the computer back they have to pay the $23 for a strap or the $32 for a charger. These kids are given anything they need when they lose it. But you know, we can't charge them. Kids on free and reduced lunch, those are the very ones that tear up those computers.
>
> P: 3: They don't see the consequences of their behavior to be meaningful enough. They feel that they can get away with it.
>
> P:8 We need a stronger policy. We need more enforcement.
>
> P:2 Silent lunch cannot be our end-all be-all punishment and that's what it is. Why would the kids stop doing it if nothing happens?

Cause Theme 3: Training Programs are not Teacher Centered

Each of the nine teachers interviewed stated in some manner that teacher training shortcomings contributed to one or more of the issue themes. Teachers communicated various issues related to the training such as inconvenient scheduling, lack of differentiation, lack of

depth, instruction by outsiders, not continuous, and that it was not based off of teacher needs. These different concerns regarding teacher training programs and professional development all shared the common characteristic that they were not teacher-centered in their design, availability, and relevance. As to the relevance of the training, one participant, P.3, stated,

> They are not setting the time aside that when they give us workshops or seminars they really need to make them worthwhile workshops that are purposeful, what we are actually going to be using, not trivial things of nice to know, add this to your tool bag and tricks. I'd rather know essentially what I really need versus what is nice to have.

Teachers commented that the training was usually presented to large audiences of teachers early in the year. P.9 stated that,

> A lot of us feel like we are not adequately prepared to go through programs. The training is not in-depth enough. Those two or three days at the beginning of school, that's not enough time. You're speaking to the masses and trying to get the basics covered.

Similarly, P. 4 said,

> There is not proper training. You may have one day at the beginning of the year. I've never had DyKnow training except for what was asked for, for about thirty minutes. It's always just a brief overview. It's never this is specifically how you do it hands on let's try it out kind of thing.

The teacher training was distant from the teachers, similar to them watching a video presentation. Teachers with the most difficulty adapting to the new technology requirements under the one-to-one initiative stated that they needed someone work with them on an individual basis and allow them to undertake a trial-run as part of the learning process. P.8, an experienced teacher but new to the one-to-one environment stated,

> Even at this late date I am still trying to maneuver through and work out kinks. Whenever I do something new I have to go through the process several times to make it work unless I have someone holding my hand showing me this is what you do. This is what you do. I need to walk through the whole process and do it myself and then I'm good.

P.5 offered insight into the training offered by the district at times that were not desirable for teachers to attend. Specifically, district technology training was offered during the middle of summer in which few teachers attended. The cause theme of training programs lacking in terms of being teacher centered was contributed to by P.5 with the following:

> Yes, it's usually offered during the summer. I know a lot of people don't want to give up any days of their summer to come do anything. I know that there have been trainings that I went to over the summer and there is only two people in the room. So the district paid a trainer to train two people. Why hold a training if only two people are going to show up? Doing the training in the time leading up to school would probably make the most sense.

Cause Theme 4: Students Lack Training in Digital Citizenship

Eight of the nine teachers contributed to Cause Theme 4, sharing that students lack training in digital citizenship. Digital citizenship refers to an understanding of the appropriate uses and care for computers. Teachers felt that students were given laptops but did not understand the basics regarding online behavior, computer care, an explanation of ownership and accountability, and the computer expectations and consequences. P.3 stated that the computers were such a powerful tool that their usage necessitated accompanying education:

> Root cause is we're giving them a tool that is powerful but at home their parents aren't going to be monitoring them. So root cause is not having the respect for the tool and how it is supposed to be used appropriately. So again it goes to training. Root cause is not

> giving the kids training, not giving the parents training of how to properly use a computer.

Another teacher, P.4, stated that, "They don't understand that that computer is for their school use education. When you come without that, you come without a pencil or your notebook, it's just as bad. They see it just like their Xbox at home." The students, according to P.6, do not understand either the intended use of the computer as an instructional tool or that it is not given to them as a form of personal property. P.6 stated, "I think they consider the computer their own personal property that they can do with whatever they want to. When they take it home that's what they do. They put software on there that shouldn't be on there." According to P.9,

> Some students have actually not had access to that kind of technology until they got the computers here and they will just do their own thing thinking about all the things they could be doing or researching. You know they just zone out. They have access to the world that they didn't have before except for maybe on the TV.

Students lack of understanding regarding the proper care and use of their laptop was echoed by P.5 as well:

> Some kids, this if the first computer they've had or the first laptop they've had and they're kids. They don't really think about things all the way through all the time. So if they do not think about how easy it can break if you do x,y, and z, then they're gonna find it out the hard way.

Cause Theme 5: Tech Support is Overworked and Lacks Admin Support

Eight of nine teachers interviewed shared that they felt a cause of Round 1 issues was that school and district tech support is overworked, understaffed, and lacks support from administration. The school site under study has had one tech, or IT person, for the majority of the

year but recently hired an additional person on a part-time basis to assist with a student population of approximately 600 students. Teachers did not blame the IT person but were empathetic regarding their workload. P.4 stated,

> I know Mrs. X is very bogged down. It's easy for me to be patient with her because she's trying to be helpful. I also understand that she is not backed up from downtown necessarily like she could be. I know that she's had to fight for certain things that we've wanted.

Another teacher, P. 1, in a similar fashion, acknowledged central office IT personnel and school-based IT were overwhelmed:

> You've got the IT Office. Yeah, some of them are trained. Some of them were laterally promoted from other branches once they realized that IT needed more help. They don't really have the training. They don't really have the background and even if they do they're overwhelmed because you have 600 kids just in this building and we have two IT people. That's a lot. Some buildings don't even have one. And then you have downtown. Our IT downtown is the central hub and they are overloaded with traffic and support tickets and all these things they have to fix every day because all these kids are working faster than they are.

In response to a follow up question regarding why Tech Support took so long to respond to work orders, P.7 stated that district technology support personnel purposely delayed solving issues. According to P.7 this was done to discourage teachers from contacting Tech Support and thus adding to Tech Support's workload:

> It's to frustrate you to get you not to worry them. They don't know what to do so I'm gonna send you to the next person who does not know what to do. But nobody knows what to do. It's the blind leading the blind and that's in The Book.

P.6, in response to the potential cause of Issue Theme 5, Insufficient Tech Support, stated, "Overworked and underpaid. Overworked and underpaid. That's the cause of a lot." Similarly, P.2 attributed a lack of funding as a factor in Tech Support being understaffed. P.2 stated,

> I would imagine money is another issue. They do not want to pay for the support we need… I think the district just kind of throws people wherever. But as far as it being shorthanded I think it's just a money issue. They do not want to pay for extra people. I mean we just got a second IT person in like April or March.

Cause Theme 6: Top-Down District Control and Loss of Teacher Autonomy

Top down district control of classroom practices resulting in a loss of teacher autonomy and control of disciplinary authority and instructional delivery decisions was shared by eight of the nine teachers. Under this broad cause theme, teachers stated that they experienced a loss of independent disciplinary authority, district micromanagement of instructional practices through detailed observation checklists, unrealistic district expectations to continuously walk the room and yet be stationary to monitor students on DyKnow, and the requirement to use technology at all times. P.5 contributed to the cause theme with the following:

> How are you supposed to keep an eye on what you are doing, keep an eye on the kids and what they're physically doing, and keep an eye on DyKnow and have Class Dojo up? There are too many things that they want us to have up constantly and not enough screens. There is no way for us to monitor everything all the time.

This idea of unrealistic district top-down control of classroom instructional practices was again stated by P.2:

> As a classroom teacher we are expected to be up walking around our classroom. If we are sitting down at a desk when we get observed that's negative points on us. How are we supposed to do that and monitor their computer use? So it's like a catch 22. Do I monitor them or do I walk around?

P.6 shared similar frustration in terms of district mandates to constantly be walking around the room and simultaneously be monitoring student computer use:

> I think that if we are using the computer then we're not walking around the room. So it's difficult to monitor it on the computer and be up and walking around the room also. So you have to be sitting at your desk or carrying your Lenovo around with you which is kind of awkward and doesn't really work very well.

P.7, in accordance with P.6's concerns related to micromanagement of classroom practices, commented on the district mandate to be stationed at the door as students arrive and also to continuously circulate the room:

> So you cannot even catch your students before they log on to their computer because you're at your door, where you're supposed to be… It's not convenient to walk around with your computer and try to monitor other students and teach your class. You only have two hands and you can only do so many activities at once.

P.9 felt that the lack of ability to make independent disciplinary decisions led to some of the issues identified in Round 1 and stated that,

> Teachers should be allowed to teach with minimum distractions. If you have a rowdy bunch of kids or a rowdy student you should not have to hold that student for a full 90

> minutes and try to teach because you're gonna lose your students. You're gonna lose what you are trying to do. The kids are gonna lose their focus. The class needs the teacher in front working and giving examples and if you cannot send a child outside for 5 or 10 minutes to get their act together then you've lost teaching time. You've lost quality time and it's not fair to the teacher or the other students.

Cause Theme 7: High Turnover Rates

Six of the nine teachers interviewed in Round 2 contributed data under the cause theme of *high turnover rates*. This cause theme refers to instability of full-time teachers, substitute teachers, counselors, librarians, security, administration, and other support staff members, all of which experienced repeated turnover since the implementation of the one-to-one initiative. High turnover rates and teacher absenteeism were seen by teachers to lead to a lack of a structure, vision, and increased teacher workloads that impacted one-to-one implementation effectiveness. P.6 stated,

> We've had such changes in the administration. Our discipline has changed so much over the years that we do not have a school culture or climate that supports discipline in any way. I think it's that we have this revolving door in the administration here. To have had five principal in six years is crazy. So we don't have an established way to do things because its turning through so many administrators.

High turnover contributed to an increase or magnification of Round 1 issues. These increased issues in turn led to an increase in turnover as teachers experienced greater classroom challenges and feelings of being undervalued and unsupported. P.9 explained that teachers regularly lost planning time due to covering for absent teachers or open positions unable to be filled:

> We have a history of teacher absenteeism. We have a lot of teachers who are out on a regular basis year after year after year…When you have teachers out, teachers who have never been hired in positions, somebody has to take care of those classes. As a professional you're not just going to sit in your classroom while the classroom next to you is missing a teacher.

Disciplinary issues contributed to increased turnover and made it difficult to retain substitute teachers according to P.5:

> As far as coverage goes they had a really hard time getting subs because there is no behavioral discipline. We have lost some subs that we have had for years. The subs have said I'm not coming back because of x,y, or z.

P.2 felt that the overwork and declining behavioral issues contributed to a feeling on the part of teachers of being undervalued which in turn led to increased turnover. P.2 stated,

> We wouldn't have teachers quitting if they were supported and valued. I can think of four throughout the year and I can think of more next year who won't be here just because they don't have to and it's not worth it.

Cause Theme 8: Training Staff and IT Personnel are not Familiar with Classroom Issues

Five of the nine teachers contributed cause theme data related to district technology trainers and IT personnel not being familiar with issues teachers faced in implementing the one-to-one initiative at the classroom level. The lack of classroom experience and familiarity with implementation issues on the part of those responsible for training and technology support augmented a feeling of disconnect and technological futility among some teachers. P.6 stated,

> So I think the new teacher trainings needs to focus a whole lot more on technology from people who've been there and been using it instead of just the downtown people. Because they haven't been using it in the classroom and I think that's part of the problem.

Inexperience with classroom issues also meant that the training and tech support was limited to software or computer basics and did not adequately address classroom implementation of the technology, as was stated by P.4:

> When we asked them to do a sample lesson they couldn't do it. So I think the people training us on it have never actually used it in the classroom. They can't answer my questions. They've never used it and they don't know the problems because they aren't using it. So they've trained me. Their job is done. That's not part of their job to come back. They are sent to another group. There is no middle person that says, 'Hey what's your problem?'

P.7 shared concerns that the district training, whether for technology specific events or general instructional delivery methods was not successful because the trainers were unfamiliar with issues associated with teaching in this particular setting: "Yes, it can be done [effective training], but at the same time we need to see someone who comes from the same school structure and atmosphere we have at our school doing these small groups with behavior problems." This same sentiment was echoed by P.9 who commented that district tech support personnel understood the basics of the technology but were not familiar with specific programs or how to use tech tools such as the Promethean Board for classroom instruction:

> They are tech people and they can do the basics but that's about as far as it goes. It's not that they can't do their jobs, that's what they are charged with, but to me they should do more than just look at a computer. So it does force the teachers to go to somebody like

you to help with the Promethean Board or with a particular program. I really don't think that some of the Techs that the district hires really have the skills to do the job. It's not really their fault. It's just the way they were hired.

Round 3 Solution Theme Analysis

The goal of the third round of interviews was to use the cause themes established in Round 2 to elicit solutions to the root causes of previously identified issues. Each cause was read to the participant with the added question from the researcher of, "What solutions would you offer to remedy this cause?" The researcher also informed the participants that the cause themes may not have been ones that the individual teacher contributed to. Therefore, they could skip the question or choose to offer solutions that could contribute to the alleviation of the cause theme.

As was previously noted, raw cause data in Round 2 was treated independent of Round 1 issues. The link between the specific issue and the cause was separated. Similarly, in Round 3 raw solution data was decoupled from the specific cause it was provided as a remedy for. As in Round 2 cause theme analysis, this allowed for the solutions to stand for one or several causes which in turn led to issues impacting teachers in the implementation of the one-to-one initiative at the classroom level. A solution theme therefore represents a higher level long-term proposition than would be the case if solutions were directly linked to single issue responses. Solution themes represent the collective contributions of the nine teachers to solve complex issues greater than a single teacher could have provided. The use of multiple rounds of interviews, member checks, consensus, theme creation, and eventual solutions to complex issues are key components of the expert elicitation process (Boring et al., 2005). Each of these solution themes presented in Table 3 and expanded upon below, once enacted, have the potential to impact multiple issues.

Table 3.

Breakdown of Summarized Participant Responses Contributing to Round 3 Solution Themes

	Group 1: 1st Year Teachers			Group 2: 2-10 Yrs. Exp.			Group 3: 11+ Yrs. Exp.			
	P.1	P.2	P.3	P.4	P.5	P.6	P.7	P.8	P.9	Total
Stricter and clearer disciplinary policies, especially for initial offenses	x	x	x	x	x	x	x	x	x	9
Use teacher feedback as main component of policy decisions and training design	x	x	x	x	x	x	x	x	x	9
Use teacher technology experts as primary trainers and mentors	x	x	x	x	x	x	x		x	8
Administration should have relevant and recent classroom experience		x	x	x	x	x	x		x	7
Parents and students should attend basic computer training and pass quiz prior to laptop distribution	x	x	x	x			x	x	x	7
Gradually phase in program and policy decisions	x		x		x	x	x	x		6
Require a Digital Citizenship class for all students	x	x		x	x	x		x		6
Create district level position for a teacher liaison/researcher		x	x	x		x		x		5
Admin. should engage in teacher appreciation outreach		x			x		x		x	4
Offer customized, leveled teacher technology training	x			x	x	x				4
Total shared solutions per teacher	7	8	7	8	8	8	7	6	6	

Note. P.1-P.9 refers to Teacher Participants

Solution Theme 1: Stricter and Clearer Disciplinary Policies

As a solution to Round 2 cause themes, policies should be stricter, especially on initial offenses, and clearer in terms of digital infractions. Nine out of the nine teachers interviewed contributed to Solution Theme 1. Issues with discipline were common in Round 1 and were offered as a major cause theme in Round 2. In reference to stricter first offense penalties, P.2 stated,

> I think stricter punishments the first time they do something. Because I mean ooh it's a slap on the wrist or a signature in the Behavior Log. But you know as well as I do those Behavior Logs are ridiculous. The only thing they are good for is when you have a parent conference and can go back and say this is what they've done.

This sentiment was echoed by P.9:

> The only way you can fix that is to take care of that discipline off the top… They need to be more aggressive up front taking care of those initial violations. The first time the child does something… get the message across because if they get a thousand chances you are not getting the message across. Around and around we go. Where it stops nobody knows.

Teachers also wanted clarity on what to do when it came to computer usage violations. Teachers felt like there was some gray area between what was a teacher, administrator, or the IT person's specific responsibility when it came to enforcement of computer related behavior protocols. P.8 stated, "There should be no guesswork as to what happens after the first offense, after the second offense, etc." P.6 similarly provided interview data regarding the necessity for clearer and stricter disciplinary policies:

> There needs to be a clear designation of responsibility, you know, kind of like an organization tree. Who knows right now? It's kind of like a mystery. What's the step? Is it for a teacher to do it? Is it for IT to do it? Does it go straight to administration, which doesn't seem right? Who does what with the technology infractions? It's very gray… They [students] know that there's no real consequence.

Much of the discontent with the behavioral policies stemmed from teachers not being able to send students out of the room this year, even for behavior that essentially shut down the learning environment. A solution provided by P.3 was to, "Give teachers the authority to manage

their classrooms again. If they need to remove a student who is being disruptive they should have the right to send them to an office." In regards to being able to remove disruptive students and handle initial infractions more effectively, P.9 stated,

> We are getting a new principal. One of the first things I am going to say at our first meeting is that she needs to take of that discipline off the top. Teachers need to be able to teach for the 90 minutes they have the students. We don't need to go through what we just went through where teachers were abused.

Solution Theme 2: Use Teacher Feedback as Main Component of Policy and Training Design

Teacher feedback should be the driving force behind central office decisions regarding one-to-one policy, training programs, behavior policy guidelines, and proactive troubleshooting. Feedback should be anonymous and without repercussions. Teachers attributed much of the district's issues from faulty programs, unrealistic mandates, being in reactive mode, low teacher morale, etc. to the lack of receptivity regarding teacher feedback. Teachers felt like the district disregarded their expertise and knowledge. P.4 stated,

> At this point you know what the kids are going to do. Or at least the teachers, we know what to look for… Other than this interview with you I've never been asked what problems I've had with technology and I've been with this system for a while.

The solution to this offered by teachers was for the district to actively solicit teacher feedback and use it to design their policies. P.2 stated, "Again, listen to the teachers. We know what issues are going to be in our classroom and how the best way to handle those situations are." This sentiment was repeated by P.8: "A good leader listens to what the subjects have to say. Even if he doesn't choose what they say, he puts it in the balance. He has an ear for their concerns." P.1

offered the solution of soliciting feedback from teachers regarding administrative decisions through a democratic approach:

> You could even try a democratic way and when they offer a decision have either polls or voting for certain issues… For the large majority of the administration at the district level I feel that they are removed from the classroom and it affects their decision making. They don't see the ripples… It feels like we're just getting jerked around and are at the mercy of their whim of that day or whatever it is.

Teachers voiced concerns that the lack of receptivity to teacher feedback impacted the ineffective teacher training and professional development identified in Round 2. P.4 stated,

> I think they need to obviously do a better job at the beginning of the year. They give us this training but then we are never allowed to give any feedback about if we think it was helpful or not. So allowing us to say what we would like training on. Because we hate sitting through another Pearson training and it's a complete waste of a day for them to tell me how to open a program that I've been using for years but I still don't know how I can communicate data with parents through that program. I know it's available. I don't know.

P.9 similarly offered the gathering of feedback data at the beginning the year to assess needs as a solution to issue themes from Round 1:

> We need to have our issues presented to them so they can have something ready for us… One best things the administration can do is to survey your staff at the beginning of the year and see what the needs are and then you gather that data and go from there.

Solution Theme 3: Use Teacher Technology Experts as Primary Trainers and Mentors

The resource of knowledgeable, motivated, and experienced teachers, in terms of technology and one-to-one initiative expertise, should be tapped into and utilized according to

eight of the nine teacher participants interviewed in Round 3. Participants wanted to use teacher technology experts as the primary trainers and mentors who not only had classroom experience but had experience teaching specifically within this district's one-to-one initiative. P.9 stated, "First of all they do not need to be contract employees. They need to be hired by the school system." P.9 also added, "I personally learn better when a teacher in the building teaches me rather than going to a central location." Similarly, P.1 offered,

> I think we need to have trained staff who can be IT assistants, not necessarily aides but like lateral colleagues… For troubleshooting and day to day issues have a couple of teachers who are willing to donate maybe a planning period a week.

P.3, similarly to P.1, wanted teachers to be the main instructors because of their understanding of the practical uses of the training content:

> The instructors most of the time have been out of the classroom for many years. Maybe they did start out as teachers. They have to focus on stuff that's practical, in use currently, that's useful, not just fun things or apps for the kids… We need to have a person that uses it in the classroom and can tell you step-by-step, 'This is how you do it.' An experienced person teaching a non-experienced person… What do you call it? Peer instruction, that those that have learned it or been in the system and have been in the classroom can make a schedule of volunteering I guess.

Again, P.7 echoed the other participants with the following: "I think we'd probably hire teacher tech trainers. That would help. Or we could have the IT people shadow teachers and come into the classroom with you."

Solution Theme 4: Administration Should Have Relevant and Recent Classroom Experience

Administrators at school and district levels should have relevant and recent classroom experience as instructional leaders within a one-to-one computing environment according to seven of the nine teachers interviewed in Round 3. P.3's statement is emblematic of the sentiment of responses connected under this solution theme:

> I think one of the biggest things, and this will probably go for a few different issues, is a lot of the people who are making our policies either don't have classroom experience or they have not had classroom experience in a very long time. Today's kids compared to when I was a kid… it's already so different.

P.4's contribution to this solution theme was very similar to that of P.3.

> P.4: I think our current situation is mostly that we have a superintendent who does not have a background in education… When you put people in charge of education who know nothing about education and they look at it from a business standpoint then that's gonna be the problem.
>
> R: So people who are making these top down decisions need to have first been teachers or instructional leaders?
>
> P.4: Yeah, and the ones that were, it's been fifteen or twenty years ago and they are just so removed from the classroom that everything's in theory. So I think when we get TOSAs (Teacher On Special Assignment) that are straight out of the classroom they're understanding and more supportive cause they understand what we're going through.

Teachers, such as P.7, felt like the policies from central office were out of touch with the reality of one-to-one implementation issues:

> One thing, the people making the rules are not in the classroom. They have not been in the classroom in so long. I can think of great things to do with the ideas but to see them come through the process and make sense to do, it's not there. I think that's the problem because they are doing it at the top.

As P.7 stated, there was a general feeling that the administration was distant from realities of the classroom and from their teachers. P.5, in accordance with P.7, said, "We feel like the Home Office doesn't care. All they bother to look at is our scores. They don't come out of the office to see what we're really doing."

Solution Theme 5: Parents and Students Should Attend Training Prior to Laptop Distribution

Seven of the nine teacher participants offered the solution that prior to distribution of laptops students and parents should be required to attend an initial computer training presentation and pass a basic quiz related to computer usage agreement guidelines and expectations. This solution theme relates to initial preregistration training rather than a graded academic course. P.1 makes reference to a course but clarifies by giving the example of Safe Schools Online Training where teachers are required to watch short videos and take quizzes to ensure that they have been familiarized to certain policies and procedures:

> One idea I had was maybe enforcing a digital or cyber safety course that the students have to complete. Like you know the teachers have the Safe Schools Online Training where we have to go through and watch videos and take quizzes and you're given a score. You have to pass a certain amount of questions in order to pass that course. As part of the registration process next year make them take a quiz.

Similarly, P.3 was in agreement with P.1 in terms of advocating for a one-time large-scale presentation early in the year to coincide with registration and laptop distribution:

> This year when they scheduled the distribution of all the laptops, if it was just one day before school started or even the first hour, since we have the setup of homerooms, maybe some type of training session that first they train us teachers, something standardized… They need to set aside a time for the students to even know how to turn them on because some students are way advanced and some students have never even touched a computer. Either they can do it that way through homerooms or through a big cafeteria presentation with everybody right after they have their laptops issued and a big presentation on a big board to be guided.

The emphasis of this theme was that the large assembly presentation would provide the basics regarding expectations for proper computer use and allow the administration and teachers to speak with a single voice. P.9 stated,

> I think the administration should get all the kids together. You can do it by boys, girls, by grade, and go through these things. Go over a presentation in the auditorium. You have a big drop screen in there… If it comes from the principal and then you take that and show them how it fits in the behavior code and how they can be punished or have consequences for it then that's a good start.

P.8 similarly advocated for a whole-school assembly in which students could be shown how to care for the laptops and how to access relevant program. P.8 stated,

> Give them a workshop. I don't know if workshop is probably the wrong word, but a tutorial and not just tell them, show them…When the kids are issued their laptops I think there should be an assembly held where there are different people who are walking around and maybe one big person who is leading it all. Different ones are walking around

making sure that the students are doing what they're supposed to, showing them how to do the different programs, whatever they need at that time.

Solution Theme 6: Gradually Phase in Program and Policy Decisions

Six of nine teachers, two from each experience level subgroup, contributed to Solution Theme 6. Under this solution theme program and policy decisions related to the one-to-one initiative need to be phased in over time from small-scale pilot groups who vet and fine-tune and then gradually expanded to the entire district. This solution theme describes the teachers' awareness that there needs to be adequate transition time to test out programs and policies and elicit feedback during early implementation. P.8 stated that because of the wide range of technology ability amongst teachers the district needs to allow time for teachers who are inexperienced with technology to work to attain proficiency:

> Teachers come from different backgrounds and you may have someone who is very tech-savvy, highly skilled with the use of technology. Then you may have some old heads who are used to doing things the old way. So you have to give them time to catch up and change what they have been doing and come into the new. At least give them the proper training and just allow them to catch up.

In regards to the absence of this transition time, P.1 stated, "It's like teaching somebody how to swim by throwing them in the deep end." The researcher then asked, "So how do we make that transition easier?' To this P.1 continued,

> You start on the shallow end and you take like a focus group and you let them test it in a real-time situation. You know you give one or two teachers in to being a beta tester for whatever focus group and then you say here's what we're looking for, list your problems, then you expand it out.

In terms of the solicitation of feedback from teachers during early implementation, P.6 stated,

> You need to kind of try it out in a trial run like pilot schools. You start it out as a pilot program and then you get feedback. You get honest and valid feedback from the parents, the students, from the teachers, and then adjust and don't accept that some textbook company that suddenly decided to go digital has got the end-all be-all.

The lack of vetting and adequate transition time for full implementation was shared by P.3 as a shortcoming of public education that could be alleviated by looking to the private sector:

> Nothing is perfect. Even with commercial software technology companies they test and test and test before they put it out in the market. And I know it's for profit but they do it in a business sense because they want their products to be correct when its put out to the public. So I know that's not the mentality of the education but it sure would take out some of the frustration.

Solution Theme 7: Require a Digital Citizenship Class for all Students

Six of nine teacher participants shared as a solution that students should be required to take a Digital Citizenship class, taught by a specialized teacher, with curriculum that covers cyber security, appropriate computer usage and care, and other related computer skills. This theme is distinct from Solution Theme 5 because it describes a required course similar to other academic disciplines such as math or science while Solution Theme 5 relates to pre-disbursement, registration-stage basic training and requirements. P.2, in describing the need for an ongoing academic course stated,

> I think digital citizenship in itself should just be a course even if it was like a nine week, which would be the equivalent to a one semester course the way our schedule works out.

> In sixth grade, even in elementary settings, teaching the students how to act responsibly on the Internet.

P.6 similarly advocated for a designated course taught by highly qualified instructors who follow established curriculum standards:

> Oh, they're 100% lacking in it [digital citizenship]. But they are lacking in a lot of civil discourse type stuff to begin with and it has to be taught. You know, somebody, somewhere, it can't be just like this teacher has this idea and this teacher has this idea. I think a lot of teachers have a lot of good ideas. The one class, Cyber Security, the sixth grade… they didn't even have a curriculum this year. They didn't have a pacing guide. I think there needs to be a set of lessons that we can do… It needs to be done system-wide. It needs to have teacher buy-in. The teachers need to be trained in it and it needs to be like a curriculum.

Currently at this school, students are provided with computers without training on computer basics such as typing, saving files, or proper care. While core academic teachers do provide some of this education, teachers wanted a dedicated class taught by a skilled instructor. P.5 stated,

> I think we need to go back to some sort of basic computer class... The kids do pick up pretty quickly but I notice that some of them don't even know how to type. So even if you had a class you could trust to do the right things they can't take notes and keep up. What's the point of giving them this type of technology if they don't know how to use it?

Again, this sentiment was shared by P.4: "The whole first nine weeks could be just digital citizenship. How are you careful about the things you make? What is this computer for?"

Solution Theme 8: Create a District Level Teacher Liaison/Researcher Position

Teachers were concerned that not only was their feedback not solicited or valued by the school and central administration but that there was also hesitation to voice honest opinions due to retaliation and job security concerns. Therefore, five of the nine teachers felt a solution would be to create a position for a teacher liaison/researcher. This teacher liaison/researcher would bridge the gap between teachers and administration. They would elicit from teachers issue themes and potential solutions anonymously and in a similar manner to the way this research study was conducted. P.8 stated,

> I would do what you are doing right now. I would look at the patterns. I would look and see what keeps happening that we are not pleased with and then try to figure out why this is happening."

P.6 also alluded to a new central office position held by someone who can act as a liaison, using their experience within the one-to-one program to influence administrative decisions:

> I think part of their problem is there are too few of them who have been doing this in terms of working with the digital one-to-one, so they don't understand. They probably would benefit to have some position or somebody who has actually been in the classroom and has been using it and understands it. Have some sort of positon at central office.

The need for a liaison/researcher who could not only listen to issues but report back to teachers on progress was shared by P.3:

> They really do need to have more contact, actually come to the school, to where they come and hear grievances without backlash and to have a person truly list all those things and to actually come back and say 'Okay, we have heard all this and this is what we are doing.' Not just say it but do it by action.

The idea of a teacher working as an intermediate between administration, IT, and teachers, was also supported by P.1, "I think we need to have trained staff who can be IT assistants, not necessarily aides, like student aides, but like lateral colleagues… like a teacher liaison is what we were calling it."

Solution Theme 9: Administration Should Engage in Teacher Appreciation Outreach

Four of the nine teachers contributed to this solution theme in which district and school administration should engage in outreach to teachers to make them feel valued, appreciated, and recognized for their efforts. High turnover was the cause theme from Round 2 most closely linked with Solution Theme 9 participant responses:

> R: How do we stop the high turnover in this district?
>
> P.5: We start treating our employees like we actually value them. We're treated like we're just cogs in the machine. We're interchangeable parts. It doesn't matter if I'm here, if you're here, if some guy off the street is here. We're not made to feel like we matter.

Again, this solution was offered as a remedy to high turnover by P.7, "To cut down on turnover number one you're going to have to treat people like they're people and you have to value their input. Just because you're at the top does not mean you know it all." One of the participants, P.2, felt that any outreach would be better than what the district was currently doing:

> I feel like the district could do more to recognize the teachers and the schools. You would think that something like teacher appreciation week that the district would at least like, just do something simple, like providing lunch one day for all the schools in the district. I know that's a lot of money, or like a bottle of hand sanitizer. Just show us that you care about us.

This group of teachers, who all voiced behavior concerns and a lack of support from administration at some point in the three rounds of interviews wanted acknowledgement for the professionalism it takes to work under difficult circumstances regardless of personal issues. P.9 stated,

> I think you have to praise your teachers the same way your praise your students. Because when a teacher walks through the door you don't know what they are leaving at the front door. Some of us are leaving sick family members at home who may be dying of cancer or whatever. Some of us are leaving a stack of bills that we don't know how to pay… So it needs to be that when we walk through the door the principal shows us they appreciate us. They are going to have to show that they appreciate what we are doing instead of walking in and asking about what happened in your classroom and how you didn't cause it.

Solution Theme 10: Offer Customized, Leveled Teacher Technology Training

Four of nine teachers in Round 3, including all three Group 2 participants, provided interview data that called for a customized, leveled teacher training program designed from teacher feedback. They felt training should be offered that allows teachers to choose the appropriate level of technology training based on skill level. In addition, clear and accurate course descriptions could be provided to assist teachers in choosing the most appropriate module. This solution theme was in contrast to the way training was described in its current form as one size fits all, basic, trivial, and lacking in relevance. P.4 spoke about some of the non-customized training currently being offered and suggested that it become more adaptable to teacher feedback and needs:

> They give us this training and then we are never allowed to give any feedback about it, whether we thought it was helpful or not. So, allowing us to say what we would like training on, because we hate sitting through another Pearson training. It's a complete waste of a day for them to tell me how to open a program that I have been using for years but I still don't know how to communicate data with parents through that program. I know it's available. I just don't know how to do it… It needs to be a back and forth [training design]. It doesn't need to be 'You teach using this.' It needs to be, 'Well what do you think would be helpful?'

P.5 also felt that the training should be differentiated to the needs of the teacher:

> I think that you should probably have some kind of leveled program because most of the training that I have gone to has been incredibly basic and I'm sitting there going, I know how to use iNow. I know how to open a Word document… They are very good at training the basics but they don't have intermediate or advanced level trainings. I think it would be better if they wrote a better description of what they offer… They should give some kind of criteria. If you can already x,y,z, then this is type of training you should receive.

Echoing these sentiments and the need for differentiation based on skill level with technology, P. 1 stated,

> Make it a custom course and say in the auditorium you would have something that applies to a larger group like how to use DyKnow effectively and then for those who are not so worried about DyKnow, because they can't even access their email, you can have a smaller breakout session for four or five teachers. Maybe there would be prerequisite

courses. You show that you have proficiency in that area then maybe you get to choose every week or whenever it's offered.

Document Analysis

To triangulate teacher participant interview data a document analysis was performed. This analysis examined several relevant district level policies pertaining to interview response data as outlined in key documents. The goal of the document analysis was to compare district policies with teacher response. The documents analyzed are as follows:

- Consent Order between DOJ and School District
- School District Code of Conduct
- Laptop Acceptable Use Guidelines Form
- Student Parent Information Guide

One of the major concerns of teacher participants presented in this chapter revolves around the issue of student discipline. In Round 1 teachers identified the issues of ineffective disciplinary policies and inappropriate student computer usage as major impediments in the implementation of the one-to-one initiative. In Round 2 nine of nine teachers identified lax consequences for student behavior in general and specifically in terms of computer use agreement violations as a major cause of issues related to implementation of the one-to-one initiative. Similarly, in Round 3 nine of nine teachers contributed to Solution Theme 1, related to stricter and clearer disciplinary policies, especially for initial offenses. Therefore, a further analysis of the actual documents related to behavior can help to triangulate the teacher interview issues, causes, and solutions.

The School District Code of Conduct was created out of an agreement between the Department of Justice and the School District as part of an agreement to settle a school

desegregation case. The Consent Order calls for the creation of a Student Code of Conduct prior to the 2015-16 school year with the following revisions:

- Elimination of the use of out-of-school suspension for class one offenses;
- Review class two and three offenses and reclassify offenses as lower level offenses, where possible, and/or eliminate the use of out-of-school suspension for these offenses
- Incorporate a continuum of graduated disciplinary alternatives, such as student conferencing, plans developed by the school-based Problem Solving Teams, conflict resolution, and restorative justice strategies and limit the use of exclusionary consequences to highest level offenses under the Student Code of Conduct…

These revisions are observable in the Student Code of Conduct which calls for the following disciplinary guidelines to be followed for Class I Violations/Minor Offenses:

1st Referral: Conference with the student

2nd Referral: Conference with the student and call to parent/guardian

3rd Referral: Loss of school privileges

A student must receive three or more disciplinary referrals in a two-month period to be referred to a Problem Solving Team (PST). The PST will develop a behavior plan that includes positive behavioral interventions, strategies, and supports. Class I offenses include such things as being an excessive distraction, gambling, threats and intimidation, profanity, refusal to complete work, and defiance of authority. The student then enters a new behavioral plan giving them additional opportunities to either improve behavior or continue misbehaving.

Referrals are to be given only after the student has repeatedly violated the classroom 5-Step Disciplinary Policy. The policy indicates that for initial offenses the student is required to

sign a Behavior Log Book. If the behavior continues the student will re-sign and the teacher will contact parents and if need be set up a conference. Only after multiple warnings, signings of the Behavior Log Book, contact and a conference with parents, has the student's conduct warranted an office referral. Essentially, a student can cause excessive distractions to the class, use profanity regularly, act defiantly, and so on, for a period of months before they are removed from classroom instructional setting for any length of time.

In terms of technology infractions, the Code of Conduct contains a separate section detailing examples of class level offenses and subsequent consequences. For Class I infractions such as use of computer to disrupt class, unauthorized downloads, and unauthorized recordings, a student will generally need to have four to five violations in a class period to warrant the loss of the computer. After parent contact and before school or after school detention, a referral to an administrator may be warranted.

Students sending, transmitting, or downloading explicit, pornographic, or other obscene and offensive material with intent is treated as a Class III Infraction that immediately calls for the loss of the device and parental contact. If serious enough the Class III Violation can lead to ten days of suspension or for a student to be placed in In-House Learning Centers.

In Round 3, seven of the nine teachers communicated that parents and students should attend basic computer training and pass quizzes prior to laptop distribution. This solution stemmed from concerns that students were being handed laptops without demonstrating that they and their parents understood the related expectations and consequences. For clarification of this the Laptop Acceptable Use Guidelines Form and the Student Parent Information Guide were analyzed.

The Student and Parent Information Guide, a 34-page document, mentions "Failure to Follow Procedures" as they relate to computer use in one paragraph. It is stated that, "Any user who violates these procedures shall, at a minimum, have his/her access to the computer network and Internet terminated." The exact procedures alluded to, in terms of appropriate computer use are not included in the document. However, it does suggest that for more information the readers can consult the Code of Conduct.

The Laptop Acceptable Use Guidelines Form is required to be signed by every student and parent. It is a four-page document containing information related to proper care of the computers, student personal safety, prohibited activities, privacy expectations, and policies and procedures. The form includes the information that six of the nine teachers wanted to be presented in a training/assembly type manner in the beginning of the school year and prior to laptop distribution.

Administrator Interviews

As an additional means of data triangulation, interviews with two current administrators familiar with the school site under research provided feedback on teacher issue, cause, and solution themes. Teachers operate from a more limited classroom perspective than would an administrator who is responsible for schoolwide management. In these two administrator interviews the researcher read each of the solution themes provided by teachers and gave examples of what causes and issues the solution pertained to. The administrators were asked then asked to provide a comment. A representative sample of the feedback from each of the administrators is provided below under each of the ten solution themes.

Admin. Response: Solution Theme 1: Stricter and Clearer Disciplinary Policies

The two administrators answered this question from differing perspectives. A.1 thought that stricter disciplinary policies were reactive and would leave the roots of the behavior in place. In A.1's opinion, what was needed was a total school buy in of teachers using a common disciplinary vocabulary, recognizing when students do the right thing, and building relationships with students. Teachers urging stricter and clearer disciplinary policies was seen as a way to mask ineffective classroom behavior management skills. A.1 stated,

> The teachers need to understand that discipline is reactive. A proactive approach is what the district is taking and across the nation with PBIS (Positive Behavioral Interventions and Supports). With PBIS what you are essentially wanting to see is your teachers and your staff use the same vocabulary… The way you be proactive is you want the students to be accountable for their behavior by showing them you recognize when they are making good decisions. Doing that on a grand scale is very difficult. Everyone has to buy in. When you are looking at stiffer penalties for kids, that's not proactive. At that point that's like Teddy Roosevelt wanting to obliterate somebody so they never do it again... There is an issue of the heart that is going on and you can't put that on a policy. We have to build relationships with the students.

A.2 agreed with the teacher's solution theme and shared ways in which the district was working on the disciplinary issue by making changes based on stakeholder feedback to the Behavior Policy:

> That is something that has been heard at the district level, the Behavior Policy. And I've heard it said, it was rolled out prematurely. It wasn't ready to go. This year there has been an entire network of administrators, teachers. Parents have been asked for their feedback.

> Students have been asked for their feedback. To come up with the Behavioral Learning Guide… there are clearer guidelines for this coming school year.

Admin. Response: Solution Theme 2: Use Teacher Feedback as Main Component of Policy and Training Design

Both of the administrators agreed with the solution of using teacher feedback as the main component of policy and training design. A.2 put some of the responsibility on the teachers to be proactive in making their voices heard and using the channels of communication that have been provided to them:

> I wholeheartedly agree with that and know that to be heard you have to have a voice but you have to be proactive instead of reactive. So, you have to take the first step and come to meetings when they're offered. Take the surveys… So I agree with you that it is very important but to be heard the teachers have to talk.

A.1 thought that teacher feedback was extremely important. However, the caveat is that basing policy decisions off unsuccessful teacher feedback could lead to even greater issues:

> That's a great concept, teacher's feedback having a great influence on policies, but there is a huge asterisk next to that…good teachers. It's gotta be good teachers because if you have bad teachers and it's their feedback then I don't want their policies… That feedback from successful teachers, a teacher who is clicking on all cylinders, is priceless. The problem is if you are trying to base policies on disgruntled teachers, teachers who don't want to change, teachers who are upset and don't enjoy basically what they're doing, the policies aren't going to be fixed.

Admin. Response: Solution Theme 3: Use Teacher Technology Experts as Primary Trainers and Mentors

This was an area where both administrators agreed with the idea of using teachers as the primary technology experts and trainers. A.1 communicated that a knowledgeable, enthusiastic teacher who can communicate with teachers in a language they understand is one of the most valuable resources to be called upon. A.2 similarly agreed and provided an example of the district already incorporating some of this solution theme:

> I think that the teachers are spot on. That's one of our departments here. We call it Network Learning… I believe you find the teachers that are interested and have strong technology interests, and you teach those so they can teach the other teachers at their own site. I would concur with that. I understand what the issue is.

Admin. Response: Solution Theme 4: Administration Should Have Relevant and Recent Classroom Experience

The administrator responses here were of the same nature as those provided under Solution Theme 2. A.1 saw it as an issue of quality personnel and did not equate recent classroom experience with knowledge or technological sophistication:

> I have worked for a lady that was much older than me and she was very with it, technology. So my answer to that would be that it's the quality of the people. It's the quality of the people. It's the same as when are getting feedback from teachers. Are they feedback quality teachers?

A.2 stated that it was an issue of teachers taking the initiative to invite administrators into their classrooms in the same way it was partly their responsibility to make their voices heard in terms of feedback:

> Send an invitation. Send an invitation. There is a DOI meeting weekly and schools are visited on a weekly basis. Send an invitation to the director and ask the director to come in and teach a lesson that you design.

Admin. Response: Solution Theme 5: Parents and Students Should Attend Training Prior to Distribution

This was another area in which both administrators agreed with teacher concerns and with the overall solution theme offered. The idea of involving parents was important to both administrators. For A.2, the issue of requiring a large schoolwide assembly was possible but not necessarily the only way to provide the training to parents and students prior to the distribution of the laptops: "That's a great idea and I will pass that along… We are offering some online training videos and that might be a solution instead of a large gathering." For A.1, the idea of quiz requirements was not as important as the involvement of parents into the equation of technology responsibility:

> I think there should be something. I don't know about a quiz or what that looks like. But I do believe there should be something with a parent and a student. I think the key in what you are saying that I agree with is that the parent and the student are sitting down and going over some stuff with the computer… A lot of the problems that exist with the students need parent interaction.

Admin. Response: Solution Theme 6: Gradually Phase in Program and Policy Decisions

In terms of this solution theme both administrators' responses alluded to this being a communication issue in which programs and policy decisions were being beta tested and pilot studies were being conducted. However, much of this behind the scenes work was not known by teachers who have a more limited perspective in terms of overall district functions. A.2 stated,

> One example, we are moving into Windows 10 and we did that at pilot schools to see what works best. Class Links, I said that was being rolled out this year, was also piloted at four of our schools. We picked the tech coaches to work on our pilot with certain schools to see how that was working, to see what was needed, what wasn't needed on Class Links. So those pilots are done. We just don't broadcast that news a lot.

Similarly, A.1 stated that programs and policies were being vetted and that it was a necessary part of management to do so: "I believe that they are vetting and that's just not good sense to roll something out unless it's tested." A.1 also felt that when teachers are struggling and operating in survival mode that they develop a perception of what is happening at the administrative levels that may not mesh with what is actually taking place.

Admin. Response: Solution Theme 7: Require a Digital Citizenship Class for all Students

In regards to requiring a Digital Citizenship course for all students the issue of practicality was mentioned. Because of scheduling issues and money constraints A.2 stated that the standards embedded in the concept of digital citizenship are currently being taught in every school in the district through the school's media specialist. According to A.2, "Digital citizenship is actually part of the tech standards that we do have. Really, the librarians are called Media Specialists and when the students come to them that is something they are supposed to teach." The school under study in his research was without a media specialist for almost the entire year and was unable to fill the position with a certified full-time employee.

A.1 thought it was a great idea but was concerned with where the resources would become available for this kind of proposal:

> I think in a perfect world where money is not an object I think that's a good idea. In a practical world where schools are constantly fighting budgets and teachers who are only

> new for one year and don't know if they are coming back next year, I don't think that's practical. I don't think that's feasible with budget cuts to bring somebody on staff who's dedicated just for that.

Admin. Response: Solution Theme 8: Create a District Level Teacher Liaison/Researcher Position

The creation of a teacher liaison/researcher position at the district level was seen as a good idea by both administrators. A.2 took notes on the teachers' solution theme and stated that this information would get passed along. A.1, focusing on the opportunity costs of such an expenditure stated,

> I'm gonna answer the exact same way. That's a great idea in a perfect world where you've got money. In the world I live in, in practicality, another bus monitor would do better for me for my money. If you're going to pay somebody eight or ten dollars an hour to sit on the bus that's gonna solve a lot of issues for me too.

Admin. Response: Solution Theme 9: Administration Should Engage in Teacher Appreciation Outreach

In terms of administration engaging in a district-wide teacher appreciation outreach the two administrators recognized the importance of feeling valued but suggested that some of this can and should come from other sources besides the administration. A.1 expressed that gestures like free teacher lunch or classroom supplies as gifts were trivial and did not reflect where the most substantial job satisfaction should come from:

> I hate to be disagreeable but to me what is most important in this life, what we get take with us when we are no longer alive anymore, are people. The things that are eternal are people. So I could care less about eating a sandwich and getting hand sanitizer.

A.1 continued to tell the story of a parent that went of their way to offer thanks: “That to me is appreciation. That’s why were in this business. It’s not about sandwiches.” A.2 stated, “I understand the teachers wanting that appreciation. Nobody wants to do anything unless it’s appreciated.’ A.2 added that the PTA, in concert with the administration, has a major impact on whether teachers feel valued for the work they are doing:

> I have worked in several schools in the district and it’s amazing to me to see the difference between schools that have a very, very, involved PTA and schools that don’t have an existing PTA. I know that’s not administration but I feel there is a marriage between PTA and administration, and the PTA feels more welcomed when the administration is doing that outreach. They will mirror what the administration is doing and the parents are more likely to help.

Admin. Response: Solution Theme 10: Offer Customized, Leveled Teacher Technology Training

This solution theme was embraced by both administrators. It was seen as a practical solution that would make already existent training better for teachers. In reference to the district offering a customized, leveled training program with more teacher choice, A.1 replied, “I could buy that. That makes sense and that’s not a money issue.” A.2 shared similar experiences with being slowed down in training because the skill level of the less knowledgeable trainees was holding back the rest of the class: “I have seen trainers have an intermediate group and they get one beginner and they want to go back and take baby steps.” A.1 continued, “I agree, and if it’s geared for intermediate it should stay intermediate and not revert back. Adults don’t want to be bothered by losing time because we have a limited amount of that time.”

Summary of Data Analysis

The findings presented in this chapter are the result of the analysis of 29 interviews and over ten total hours of raw interview data. The interview process was divided into three rounds. The purpose of Round 1 interviews was to allow teacher participants to respond to an open-ended question regarding issues they had experienced implementing the one-to-one program. Their raw interview data was transcribed, analyzed, then used to extract relevant issue summaries. The researcher assigned each portion of the data to an emerging category until clusters of respondent feedback could be converged into independent themes. For a theme to have been established four of the nine teachers were required to have contributed responses that populated the theme. These issue themes then became the foundation of Round 2 interview questions. In Round 2, participants were asked to attribute causes to Round 1 issue themes. The same coding process was used to create cause themes. The cause themes served as the prompts for Round 3 questions aimed at eliciting solution themes from respondents. In between each subsequent round of interviews member checks were conducted to provide participants an opportunity to add input regarding the themes.

After teacher interviews were concluded a document analysis was conducted to add an additional layer data to triangulate some of the teacher themes and responses. The data analysis primarily covered documents related to behavioral issues and student computer use. Behavioral issues and a lack of clarity and enforcement around general conduct and computer infractions communicated to the researcher by the teachers prompted the selection of these documents.

Once teacher interviews and the document analysis were concluded, two current district administrators, familiar with the school site under research, were interviewed. The purpose of these interviews was to provide triangulation of data related to teacher issue, cause, and solution

themes. Administrators were asked to comment on the solutions the teachers offered as well as a portion of the cause and issue data that led to the theme.

In total, seven issue themes emerged from Round 1. These issue themes led to the formation of eight cause themes in Round 2. The cause themes were presented to participants and resulted in ten solution themes. The solutions themes are not necessarily linked to specific issue or cause themes but instead stand for actions that have the potential to affect multiple issues and causes.

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Discussion

This study is unique and distinguished from previous research in the importance it places on the value of negative knowledge. Negative knowledge originates from incorrect facts and procedures while positive knowledge comes from correct facts and procedures (Rach et al., 2013). The benefits of learning from issues, especially those of a more complex nature, is an underutilized resource in education and has seldom been focused upon in existent literature related to one-to-one computing initiatives. There is value to be gained by first eliciting from experts in the field what issues they are facing, assigning associated root causes, and only then suggesting solutions. Participants in this research study commented that they wanted teachers to serve as the primary trainers and mentors. Participants suggested the creation of a district level qualitative researcher to operate in the manner in which this study was conducted. They also advocated for teacher feedback to serve as the primary component of policy and training decisions related to the one-to-one initiative. In the language of this study, the teachers were arguing for the increased valuation of knowledge gained from experience, and especially that knowledge gained from managing issues.

Teacher participants in this study did not provide data suggesting they considered themselves members of an exclusive club of gifted individuals. Rather, their interview responses, taken in their totality, urged the opening and strengthening of two-way communication between policy makers and instructors. The teachers considered themselves worthy of the efforts and resources needed to open the channels of communication primarily because they are the group that has experienced the most issues. Issues in themselves may be nothing more than complaints

or the normal challenges in the life of a teacher. However, if issues are properly analyzed and treated as a valid reality of the participants by the qualitative researcher, they have the potential to lead to the root causes that cultivated them. If the causes are accurate enough they can be further analyzed to find solutions with the reach to extend into multiple issues regardless of whether those issue seem associated in a binary sense.

Conclusions

Three research questions influenced and directed this study in all aspects of the qualitative process. These conclusions and findings associated with those foundational questions may serve to improve the quality of future one-to-one initiatives, better the relationship between teachers and administrators, and ultimately improve the educational experience of all students. The conclusions associated with each of the three research questions are presented below.

Research Question 1: What are teacher concerns regarding issues that occur in the implementation of one-to-one initiatives?

In Round 1 teachers were asked an open-ended question regarding what issues they had encountered implementing the one-to-one initiative. Because there were no scripted follow-up questions teachers could have provided as few or as many issues as they saw relevant. Therefore, when four or more teachers shared a common issue worth mentioning it represented a legitimate finding worthy in this study of additional analysis in subsequent interview rounds. Round 1 provided seven such issue themes. The top four issue themes, taken as an aggregate, illustrate a reality from the teachers' perspectives regarding their current situation. These top four issue themes show teachers who have classrooms full of students using the technology inappropriately. The themes also show teachers are unable to fully monitor what their students are doing, partly because of a lack of proper training and partly because teachers are unsupported when they

decide to take disciplinary action in regards to student misbehavior. These top four issue themes when observed simultaneously within a real-time classroom setting represent a learning environment in decline where weak disciplinary policies and inadequate training leave educators further behind a classroom of technologically proficient and largely unaccountable students.

The document analysis strengthened the validity of the teachers' issue themes by presenting a district behavior policy lenient on initial offenses. The behavior documents also displayed policies that reduce teacher disciplinary options by mandating that unless serious offenses occur the student is to be kept in the classroom regardless of the negative impact they have on the learning experience of other students. Student disruptions and defiance constitute Class I offenses that under current district policy can occur for months before the student's behavior warrants temporary removal from the classroom.

One administrator acknowledged the inadequacies of the current behavior policies and commented that they were being addressed and would be modified going into the next school year. The other administrator interviewed understood that classroom behavior management was a pressing issue but placed the responsibility on the teacher to build a relationship with the students and reward positive behavior.

In Round 2 the issue themes served as the foundation for inquiries into root causes. In general, the cause themes demonstrated a group of teachers who felt unsupported by administration both in terms of disciplinary actions and in response to teacher feedback. Teachers communicated a concern that they were distanced from policy decisions related to the one-to-one initiative and lacked the authority to manage their classrooms as they saw fit. Students, according to the Round 2 interview data, were provided laptops without training in their proper use and care. Similarly, teachers were not trained in a manner that they felt most

beneficial nor were teachers able to consult IT for assistance with implementation questions. In summary, the loss of teacher autonomy, lack of administrative support, and ineffective training programs, contributed to a situation in which high turnover became a major concern. High turnover and a lack of continuity fed into a positive feedback loop in which instability caused increased issues, heavy workload, and low teacher morale.

Research Question 2: What are teacher perceptions of how to improve policy and practice of one-to-one implementation?

In Round 3, teachers were given the opportunity to provide solutions to Round 2 cause themes. Nine of the nine teachers proposed stricter disciplinary policies, especially for initial offenses. The teachers' main solution was not necessarily technology related. Instead, the teachers saw the computers as a tool that could be used effectively provided the disciplinary structure was in place to manage the increased issues and complexity that the introduction of laptops may have.

In spite of a challenging teaching and learning environment teachers did not reject the use of the laptops. They chose to offer solutions that served to train teachers, students, and parents, and open up communication between teachers and policy makers. Teachers wanted administrators and trainers to understand the issues they were facing and to improve the current situation rather than abandon the new technology for traditional teaching methods. Teachers expressed a desire to learn and a willingness to embrace the one-to-one initiative. However, their solutions indicated that shortcomings at the school and district administrative levels were impeding their ability to implement the one-to-one successfully.

Five of the ten solution themes provided by teachers are directly related to the idea of training, both for the teachers and the students. If Solution 4, regarding administrators having

recent and relevant classroom experience, is considered related to training then there are as many as six of ten themes related to the desire for improvement and understanding. However, what teachers would like to see different from what they already receive is that their input serves as a critical factor in the design of new training programs. Current training and policy decisions have minimal teacher input. When teachers are consulted and programs are vetted, this information is rarely shared with the teachers, leading them to feel isolated. Teacher solution themes, therefore, are productive suggestions aimed at developing an interactive relationship with administration and parents to improve the overall structure of the one-to-one policy, making it more responsive and efficient.

Research Question 3: How can the elicitation of knowledge gained from experiencing and analyzing issues in one-to-one implementation create opportunities to enhance student learning?

Ultimately, the goal of any educational policy and research study connected with education, is concerned with the enhancement of student learning. Student academic success is primarily the outcome of the confluence of the efforts of parents, teachers, and administrators working in concert for the betterment of each individual student. However, much of what was communicated in this study told the story of students operating in an atmosphere in which there was a communication breakdown between those responsible for the care of the students. Flaws in policy and practice can be corrected by open and honest communication and the desire to constantly improve. In answer to this research question, there is no one way or best way to improve student learning. However, the findings from this study indicate that at the foundational level, meaningful improvements to student learning should be based on the collective experience of experts in the field. The teachers' feedback must be accepted as valid. Included in much of the

teacher responses are the invaluable perceptions gathered from dealing with issues on a daily basis.

One of the administrators interviewed in this study praised the value of the input of teachers, provided they were good teachers. However, the qualitative researcher understands the importance of studying the phenomena as the participants understand it because their perceptions constitute the reality of what is being studied (Patton, 2002). To dismiss the perceptions and feedback of a "bad teacher" (A.1, Personal Communication, June 13, 2016) disregards the wealth of data contained in all honest feedback, especially feedback originating from the accumulation of negative knowledge.

The solutions arrived at in this study, when looked at independently from issue and cause themes, do not necessarily portray improvements exclusively linked to a one-to-one computing environment. Instead, the solutions offered by teachers are suggestions beneficial to any educational environment. The introduction of computers at a ratio of one per student is in itself neither positive or negative. However, the introduction of laptops on such a scale serves to unearth existent structural issues in the learning environment masked by traditional teaching methods.

Student learning is improved differently in each individual setting because each school, teacher, and student is unique. The data in this study supports the finding that student learning is best improved when the structure of the one-to-one initiative is designed in a way as to foster efficient and honest communication between those in the field and those in charge of policy. Student learning as it relates to one-to-one program implementation is best improved when those closest to the students are given the autonomy to control their classrooms. Lastly, student

learning is best improved when adults are willing to analyze and discuss issues openly within a non-punitive environment.

Recommendations for Practice

Data collected from teacher interviews, document analysis, and administrator interviews, offer suggestions for instructors and educational policy makers charged with the implementation of one-to-one computing initiatives. The following recommendations to improve future one-to-one initiatives are offered:

- Utilize steady and anonymous feedback from teachers to inform policy and training decisions
- Provide teachers with administrative support related to disciplinary actions, especially for initial student offenses
- Use teachers who are familiar with the district's specific one-to-one initiative as the primary trainers and mentors
- Institute a yearly initial training session or large scale presentation, that includes both students and parents, prior to laptop distribution
- Regularly communicate to teachers what actions the administration has taken in response to teacher feedback
- Provide teachers with leveled and customized training programs so that teachers may choose the sessions they deem as most relevant for successful one-to-one implementation at the classroom level
- Create a teacher liaison/qualitative research position at the district level who can serve as an intermediary between teachers and administrators

- Training materials, including video presentations and other resources related to one-to-one implementation, should be housed at a central online location making them easily accessible to teachers and other stakeholders

One-to-one laptop initiatives and the issues that arise in the implementation of them, operate at a faster speed than traditional school structures can respond to. Top-down decision making and waiting until summer to reevaluate policy is insufficient in a ubiquitous computing environment. Successful one-to-one management requires a responsive, interconnected, and efficient organizational structure. Administrators cannot assume they understand the situation at the classroom level unless they actively and regularly seek out the voice of all teachers.

Students collaborate in a natural and efficient manner to find ways around computer use restrictions. Student share information and modify their behaviors based on their own observations and the accounts of others. Educators must work to create open channels of communication to be able to respond to issues as they arise or else witness strong initial policies slowly erode as they are met with student resistance. Central to the active communication between teacher experts in the field and policy makers is that there is first established a strong structural foundation of disciplinary procedures and consequences. These consequences allow teachers to regain control of their classrooms while larger issues in policy and practice are improved through educator collaboration.

Recommendations for Further Research

This study represents a distinct approach to analyzing one-to-one initiatives in emphasizing negative knowledge and teacher perceptions to inform policy and practice related to one-to-one implementation. Teachers in this study explained that they were often trained in what or how to do something. However, they expressed need to hear from experienced educators who

could share perspectives gained from the accumulation of negative knowledge concerning one-to-one implementation. The following recommendations for further research have emerged out of teacher participants' overarching desire to facilitate communication amongst those responsible for one-to-one implementation.

One-to-one initiatives need not be treated as new in terms of their design or implementation. One-to-one programs have steadily grown in popularity since the mid-1990s (Penuel, 2006). However, current research related to one-to-one initiatives tends to focus on two broad areas, attitudes and student achievement. Studies seeking to understand attitudes at some stage of the implementation process are important but lack in terms of treating teachers as experts capable of providing effective solutions. Concepts such as teacher buy-in and teacher receptiveness to change relegates teachers, who have accumulated the most related negative knowledge, to a passive role. Research that examines student achievement in relation to the one-to-one initiative tends to measure the success of the program in regards to standardized testing outcomes. Again, in doing this teacher voices are deemphasized. Future research into one-to-one initiatives would benefit from eliciting from teachers, who compromise a wealth of knowledge, what they have gained from confronting issues on a daily basis.

This study's methodology has the potential to be expanded upon to better generalize the results to a larger number of one-to-one programs. Classroom observations as further means of data triangulation may serve as an important component to measure participant responses against. Increasing the number and frequency of administrator interviews may help to elucidate the gray area indicated in this research study between teacher and administrator perceptions and reality. Additionally, transferring this methodology to multiple school sites, within the same or different districts, may allow for comparisons between successful and struggling one-to-one

initiatives. In this study nine teachers were interviewed from a sample pool of approximately 40 teachers. Future research may be strengthened by increasing the sample size of teacher participants. Lastly, future research, by conducting the study over an extended period of time may add insight into one-to-one improvement or decline, rather than the snapshot of current issues that this study focused on.

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APPENDICES

APPENDIX A

Institutional Review Board Letter

EAST TENNESSEE STATE UNIVERSITY
Office for the Protection of Human Research Subjects • Box 70565 • Johnson City, Tennessee 37614-1707
Phone: (423) 439-6053 Fax: (423) 439-6060

IRB APPROVAL – Initial Expedited Review

May 19, 2016

Jordan Selvidge

Re: Managing One-to-One Initiatives: Implementation Analysis through Expert Elicitation
IRB#: c0416.11s
ORSPA #:

The following items were reviewed and approved by an expedited process:

- New protocol submission xForm, References, PI CV, Teacher informed consent, Administrator informed consent, Passive parental permission letter, Initial email script, Interview questions, Proposal protocol

The following revisions were received and approved as part of the requested changes:

- Requested changes xForm, Permission letter from Williams Middle School, Revised consent form, revised initial email script

On **May 19, 2016**, a final approval was granted for a period not to exceed 12 months and will expire on **May 18, 2017**. The expedited approval of the study *and* requested changes will be reported to the convened board on the next agenda.

The following **enclosed stamped, approved Informed Consent Documents** have been stamped with the approval and expiration date and these documents must be copied and provided to each participant prior to participant enrollment:

- Informed consent (version 8-9-15 stamped approved 5-19-16), Initial email script(stamped approved 5-19-16)

Federal regulations require that the original copy of the participant's consent be maintained in the principal investigator's files and that a copy is given to the subject at the time of consent.

Projects involving Mountain States Health Alliance must also be approved by MSHA following IRB approval prior to initiating the study.

Full AAHRPP Accreditation

Accredited Since December 2005

Unanticipated Problems Involving Risks to Subjects or Others must be reported to the IRB (and VA R&D if applicable) within 10 working days.

Proposed changes in approved research cannot be initiated without IRB review and approval. The only exception to this rule is that a change can be made prior to IRB approval when necessary to eliminate apparent immediate hazards to the research subjects [21 CFR 56.108 (a)(4)]. In such a case, the IRB must be promptly informed of the change following its implementation (within 10 working days) on Form 109 (www.etsu.edu/irb). The IRB will review the change to determine that it is consistent with ensuring the subject's continued welfare.

Sincerely,
Stacey Williams, Chair
ETSU Campus IRB

cc: William Flora

APPENDIX B

Informed Consent

PRINCIPAL INVESTIGATOR: Jordan R. Selvidge

TITLE OF PROJECT: Managing Digital One-to-One Initiatives: Implementation Analysis through Expert Elicitation

Consent Form for Participation in a Research Study

Managing Digital One-to-One Initiatives: Implementation Analysis through Expert Elicitation

You are invited to participate in a research study conducted by Mr. Jordan R. Selvidge. This Informed Consent will explain about being a participant in a research study. It is important that you read this material carefully and then decide if you wish to be a volunteer.

PURPOSE OF THE RESEARCH:

The purpose of this research study is to conduct an implementation analysis related to one-to-one computing initiatives. In this study you will be considered as an expert in the area of one-to-one computing. You will be asked through interviews about issues that you have encountered within a one-to-one classroom environment. The goal is to improve the ability of teachers to implement one-to-one initiatives in a manner that strengthens student learning and increases performance. There is a growing body of knowledge about one-to-one computing. This particular study takes a different approach from previous research in that it places a high value on the benefits that can be gained through collecting and analyzing the issues experienced by educators already engaged in one-to-one implementation.

DURATION

A total of nine teachers are asked to be available for three rounds of interviews and a short group interview/question answer session. Each round of interviews will last for no more than 20 minutes. The initial round of small group interviews will serve the purpose of answering your questions and gathering basic information. In addition, you will be asked to respond via email to the researcher's findings and summaries after the interview data has been reviewed from each round. The email responses are estimated to take 5-20 minutes each depending on how much feedback one wishes to offer. Your total estimated time involvement should be no more than two hours for the entire study. The interview and data collection process should last between 2-3 weeks.

APPROVED
By the ETSU IRB
MAY 19 2016
By: Chair IRB Coordinator

PROCEDURES

The procedures, which will involve you as a research subject, include: Participation in an initial small group interview for the purposes of gathering basic information such as years of experience and time availability. This will also allow you to ask any questions you have. The small group interview allows for the researcher, Mr. Jordan R. Selvidge, to select participants to complete the remainder of the study who have the most relevant experience and time availability. You may not be selected to continue the study after the small group interviews. If you are selected then you will be asked to participate in three rounds of one-on-one interviews and provide feedback on

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ETSU IRB

researcher analysis via email, with the researcher, Mr. Jordan R. Selvidge. Interviews will be audio recorded to ensure accuracy. Recordings will be stored securely in a safe location with the participants identity kept confidential.

ALTERNATIVE PROCEDURES/TREATMENTS

There are no alternative treatments available to you if you elect not to participate in this study.

POSSIBLE RISKS/DISCOMFORTS

The identities and interview response data will be strictly confidential. However, because the interviews will be recorded for accuracy there is a loss of confidentiality risk. The researcher will take all appropriate measures to reduce this risk as much as possible.

Financial Costs

There are no financial costs to you resulting from your participation in this research study.

POSSIBLE BENEFITS

There are no known potential benefits that may results from your participation in this study. In addition, you will receive no direct benefit from your participation.

COMPENSATION IN THE FORM OF PAYMENTS TO RESEARCH PARTICIPANTS

Upon completion of the study all participants who have engaged in each step of the interview and feedback process will receive $25 in cash as compensation for their investment of time in this research study.

VOLUNTARY PARTICIPATION

Please be advised that your participation in this research study is voluntary. You may refuse to participate. You can quit at any time. If you quit or refuse to participate, the benefits or treatment to which you are otherwise entitled will not be affected. You may quit by calling Mr. Selvidge, whose phone number is (256) 527-7465. You will be told immediately if any of the results of the study should reasonably be expected to make you change your mind about staying in the study.

PRINCIPAL INVESTIGATOR: Jordan R. Selvidge

TITLE OF PROJECT: Managing Digital One-to-One Initiatives: Implementation Analysis through Expert Elicitation

CONTACT FOR QUESTIONS

If you have any questions, problems or research-related medical problems at any time, you may call Mr. Jordan R. Selvidge at (256) 527-7465 or alternatively at (256) 751-1273. You may call the chair of the Institutional Review Board at (423) 439-6054 for any questions you may have about your rights as a research subject. If you have any questions or concerns about the research and want to talk to someone independent of the research team or you can't reach the study staff, you may call an IRB Coordinator at (423) 439-6055 or (423) 439-6002.

CONFIDENTIALITY

Every attempt will be made to see that your study results are kept confidential. A copy of the records from this study will be stored in a secured location with access only by the researcher, Jordan R. Selvidge, for at least 5 years after the end of this research. The results of this study may be published and/or presented at meetings without naming you as a subject. Although your rights and privacy will be maintained, the ETSU IRB and personnel particular to this research (Mr. Jordan R. Selvidge and Dr. Bill Flora) have access to the study records. Your records will be kept completely confidential according to current legal requirements. They will not be revealed unless required by law, or as noted above.

CONSENT

By signing below, you confirm that you have read or had this document read to you. You will be given a signed copy of this informed consent document. You have been given the chance to ask questions and to discuss your participation with the investigator. You freely and voluntarily choose to be in this research project.

_____

Participant's Signature DATE

_____

Printed Name of Participant DATE

_____

Signature of Researcher DATE

_____

Signature of Witnesses (if applicable) DATE

A copy of this consent form will be given to you.

APPROVED
By the ETSU IRB
MAY 19 2016
By: Chair IRB Coordinator

DOCUMENT VERSION EXPIRES
MAY 18 2017
ETSU IRB

VITA

JORDAN RAY SELVIDGE

Education:	East Tennessee State University, Johnson City, TN Ed.D. Educational Leadership and Policy Analysis 2016
	George Washington University, Washington D.C. Ed.S. Educational Leadership and Administration 2013
	San Diego State University, San Diego, CA M.A. Liberal Arts and Sciences 2011
	Vanderbilt University, Nashville, TN M.A. Liberal Arts and Sciences 2010 (transferred to SDSU)
	San Diego State University, San Diego, CA Post-Baccalaureate Teacher Credential Program Secondary Social Science 2009
	Western Washington University, Bellingham, WA B.A. History/Social Studies/Economics 2007
Professional Experience:	6-8 Mathematics Teacher, 2013 – Present Alabama
	9-12 Economics Teacher, 2011-2013 Franklin County Schools, TN
	9-12 Economics Teacher, 2010-2011 Metro Nashville Public Schools
Licensure:	Washington State Administrative Credential K-12 Principal Alabama 6-12 Math and Social Studies Tennessee 6-12 Economics and History California 6-12 Social Studies, ESL