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Perceived barriers to technology integration

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A Mixed Methods Study Exploring the Perceived Barriers to Technology Integration among Elementary Teachers in Four Elementary Schools within a Northern Genesee County School District

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Abstract

This mixed-methods study explores the potential barriers to change related to the integration of technology among elementary teachers. Data were collected through the use of a survey, interviews, and focus groups. The Concerns-Based Adoption Model (CBAM) developed by Hall and Hord (2001) was used to capture teacher perceptions of the technology integration. Additional qualitative data were gathered through an open-ended questionnaire, and followed up with interviews and a focus group with eight teachers from the district studied. Two teachers, from each of the four elementary buildings within the school district, were chosen.

The population of this study consisted of approximately 100 elementary teachers from the participating school district serving students in grades K through 12, in northern Genesee County, Michigan. Quantitative data were analyzed through descriptive statistics, while qualitative data were analyzed through coding procedures in order to identify emerging themes. Bogdan and Biklen (1982) define qualitative data analysis as "working with data, organizing it, breaking it into manageable units, synthesizing it, searching for patterns, discovering what is important and what is to be learned, and deciding what you will tell others" (p. 145). Qualitative researchers tend to use inductive analysis of data, meaning that the critical themes emerge out of the data (Patton, 1990).

The results suggest that there are four barriers to integrating technology into the daily classroom lessons and that teachers move through various degrees of change through the change process:

1. Lack of Training and Technical Support
2. Lack of Administrator Priorities and Support
3. Lack of Resource Allocation and Convenience

4. Inability to Reduce Teacher Workload

The study will serve to inform educational leaders about technology integration and the barriers to change.

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Thank you to my parents, Gary and Brenda for supporting me through this process. Thank you to Dr. Ben Jankins for being a mentor and a friend. There are many people that have supported me through this process and I hope I can someday help others do the same.

CHAPTER I – INTRODUCTION

Introduction

Technology continues to become more prevalent within our country's K-12 schools and is emerging as a necessity to prepare students for a global workforce (Barseghian, 2012). Once just an isolated computer in a classroom, instructional technologies have evolved into a phenomenon that includes the capability to connect students with other cultures, access volumes of knowledge and innovative ideas, and open doors to new ways of learning. Reports by the U.S. Department of Education (2013) show an increase of technology use and spending within school districts. Initiatives continue to emerge due to the driving force of restructuring efforts designed to move school systems from a twentieth century industrial model to a twenty-first century model that meets the needs of a society transformed by technology.

School districts are faced with many decisions wrapped around the implementation and use of technology. These decisions are often made quickly, not allowing time for the decision makers to research, collect data, and take the time needed to reflect on the roadblocks that may be present once decisions are made (Levy, 2013). Additionally, technology use for educational purposes continues to grow among students at both the elementary and secondary levels. Nationally, the ratio of public school students to instructional computers with Internet access continues to shrink. The NCES (2010) shows a 15 percent improvement in Internet availability since 2003. School use and access to new and current technologies are on the rise, and more and more states have established technology standards for students, teachers, and administrators (Bender & Waller, 2012). Teachers continue to use technology more frequently as a valuable tool in their instruction. According to the Federal Communications Commission, 97 percent of the computers located in the classroom have Internet access (FCC, 2010).

Technology has proven to be a versatile instrument for storing, manipulating, and retrieving information, possessing the capability not only of engaging students in instructional activities to increase learning, but also helping them solve complex problems to enhance their cognitive skills (Newby, Stepich, Lehman, & Russell, 2000). When compared to traditional instruction, technology integration resulted in positive effects for the cognitive and affective domains (Bender & Waller, 2013). Although the presence of computers in our schools is increasing, the frequency of technology use is fairly low (Bender & Waller, 2013). Our nation's teachers have been resistant to use technology as an instructional tool and as a means to increase student learning. Teachers are entering the profession not possessing the necessary skills to effectively utilize technology as an instructional tool (Trilling & Fadel, 2009). Despite the time and effort invested into putting hardware and software in place, much of the literature on technology integration claims that technology has had very little impact in classroom instruction (Collins & Halverson, 2009). Emerging technologies are difficult for teachers to keep up with and they often feel as though they are trying to hit a moving target. In Michigan, a survey conducted by Michigan Virtual University indicated that while most teachers reported knowing how to email and search the Web, a small number of teachers knew how to use the tools to enhance their lessons (Ertmer, 2005).

Although technology is changing the way people read, write, calculate, and think, these tools are not being utilized in our K-12 schools (Collins & Halverson, 2009). Providing additional pressure on teachers, stakeholders in education such as parents, administrators, and politicians continue to express the need for educators to use and integrate educational technology in the classroom (Keengwe, 2007). Education is currently undergoing a transformation due to the technology tools available for teachers and students; however, the change that is needed is

happening at a slow pace or not happening at all (Collins & Halverson, 2009).

Statement of the Problem

One of education's chief roles is to prepare future workers and citizens to deal with the challenges of their times. Knowledge work, the kind that most people will need in the coming decades, can be done anywhere by anyone who has the expertise, a cell phone, a laptop, and an Internet connection (Trilling & Fadel, 2009). Schools have been slow to realize this inevitable shift in education. They are purchasing the technology, offering professional development, and adjusting schedules to fit the needs of today's students (Bender & Waller, 2012). This has not proved to be enough. Barriers are still present as new initiatives, new programs, and new tools are introduced into the classroom.

An understanding and reflection of teachers' concerns about using new innovations will help key district administrators with providing the necessary support to utilize today's tools for education. The findings of this study may have implications for change and professional learning of teachers in technology rich environments. Professional development and continuous learning by teachers to integrate technology in their classrooms will have long lasting implications in preparing students for the global environment where they will live and work.

Purpose of the Study

The purpose of this study was to understand the stages of concern among elementary teachers in using new technology innovations and how perceived barriers may undermine the implementation of the technology located in the Interactive Television Labs (ITVL). The study was not intended to evaluate a school's technology program or a teacher's ability to implement technology. This study specifically looked at the technology integration within one school district using the ITVLs placed in the four elementary schools. The ITVLs were a new

innovation introduced to the school district and included technology that the teachers had never used before. All four elementary schools within the school district went from having no or little technology to a room with the newest technology. The Interactive Television Labs included a teacher desktop computer, four student desktop computers, DVD/VCR player, an interactive whiteboard, document camera, and two-way interactive capability to connect with up to three other sites across the country. The study also identified the stage of concern of the participating K-6 teachers in order to match teacher concerns with what interventions must take place to move forward in technology integration. This study also identified the barriers that were present in keeping the teachers from utilizing the technology rich ITVLs in their daily lessons.

The introduction of new innovations and new initiatives will naturally create anxiety among teachers, and barriers can slow the systemic process of change (Hall & Hord, 2001). The ITVLs installed in four elementary schools within one northern Genesee County school district provided the schools with a technology-rich environment that teachers can use within their lessons. A technology-rich environment is a classroom that Don Tapscott, author of *Grownup Digital,* refers to as "...a classroom where if a teacher were frozen 100 years ago and woke up today, they'd look around and they'd say the classroom has changed, and technology has been at the heart of these changes" (as cited in Devaney, 2010, p. 1). Tapscott describes many classrooms as environments that "...if the frozen teacher walked in, they'd breathe a sigh of relief and say, 'I recognize this'" (as cited in Devaney, 2010, p.1).

Technology-rich environments create positive changes in the classroom and improve the effectiveness of the instructional practices of the teachers (November, 2010). The researcher studied the perceived barriers among the elementary teachers and the concerns they may have when implementing the technology within the ITVLs in order to gain an understanding of what

was impeding positive change.

A grant was written and accepted to place the ITVLs in all eighty-eight elementary schools in Genesee County by the end of the 2008-2009 school year. The researcher is a former elementary principal who was included in the early stages of the ITVLs at the elementary level and was a key member on both the district and county committees overseeing the implementation of the elementary ITVLs.

The researcher has observed first-hand how technology innovations are purchased and placed in schools, only to be met with resistance when trying to integrate the innovations in everyday instruction. These observations match the findings of Laura Devaney (2010), managing editor of eSchool News, a web-based instructional education magazine. In an article outlining the benefits of educational technology, she describes how many districts across the country are not taking advantage of their ed-tech investments. In her work with Project RED, an ed-tech initiative, Devaney (2010) found that very few schools include many of the key implementation factors, despite large investments in infrastructure and hardware. Unfortunately, more available and affordable technologies are emerging, but little change has occurred in the way schools conduct their daily business. The mere fact that technology has proven to be a necessity in today's schools is still not enough to ensure teachers will use it.

Some forty years ago, researchers characterized several of the differences they observed in organizations during the change process as first- and second-order change (Ertmer, 1999). The barriers to using the ITVLs can be identified as both external and internal barriers. These barriers often act as first- and second-order change for teachers as they try new innovations. First-order change usually occurs when the school district is making the change happen. Taking a mechanistic approach, such as purchasing new computers for a classroom, yields temporary

advances counter-acted by resistance, sabotage, and loyalty to the status quo brought to the forefront by the imposed change. Common external barriers in technology integration are many times connected to purchasing hardware or software. Many of the decisions to purchase these items are made without teacher input and do not challenge one's beliefs in how lessons are delivered. External barriers may also include the lack of proper professional development on the new technology. In order to integrate technology across the curriculum, teachers must have a rudimentary understanding of how to operate a computer. Administrators often overlook an external barrier such as very basic training for teachers when it is assumed that their technology skills are at a standard level (Carbonara, 2005).

Changes that begin to question a teacher's traditional approach to teaching or methods are considered internal barriers (Ertmer, 2005). When internal barriers are overcome, change agents play with the rules instead of playing by the rules. Teachers start to see the pattern being followed and alter the basis for that pattern to emerge. Internal change occurs when teachers let change happen as a response to the revision of external barriers. Many teachers today question whether students do as well with technology as with traditional methods and do not want to face uncertainties related to the use of technology in their classrooms (Gningue, 2003). This mindset alone can act as a barrier to learning new delivery methods with new technology. Bassett (2004) asked how technology could transform the approach to teaching and learning for the better. The obvious change emerges from the deeper shift in paradigm, presupposition, or premise (Ertmer, 1999).

Identifying barriers associated with the implementation of the ITVL technology within teacher lessons will allow the local district to effectively utilize these tools for student learning. Identifying what needs to be addressed with both first- and second-order change as it relates to

these barriers will bring a better understanding of the concerns of the very people expected to make the change, the classroom teachers. The ITVLs have removed many of the external barriers such as teacher access to technology tools and the Internet. The researcher was interested in what external barriers remained and what internal barriers may continue to keep the teachers from implementing technology into their lessons. The ITVLs bring a technology rich atmosphere that the four schools within the school district studied have not previously had and allow the opportunity to fully integrate technology if teachers choose to do so.

Research Questions

This mixed-methods study investigated questions regarding the implementation of the new ITVLs present in the four elementary schools within one school district in northern Genesee County. Using both qualitative and quantitative methodologies, this study was conducted to understand the stages of concern among elementary teachers in using new technology innovations and how the perceived barriers may undermine the implementation of the technology located in the Interactive Television Labs (ITVL).

RQ1 (Quantitative): What are the stages of concern of elementary teachers when implementing the new technology innovations within the ITVLs?

RQ2 (Qualitative): How do perceived barriers affect the implementation of the new technology within the ITVLs?

Design and Methodology

The focus of this mixed-methods study was to explore teacher concerns and potential barriers of change that impede technology integration within the school district. The school district is located within the Genesee County Intermediate School District and has an enrollment of over 4200 students in K-12. The school district has a middle school and one high school. The

researcher used a mixed method approach to glean the concerns and the barriers of the teachers in implementing the technology in the Interactive Television Labs located within the four elementary schools into their daily lessons. A 35-question survey from the Concerns Based Adoption Model (CBAM) was sent to all of the 1st through 6th grade teachers within the school district (Appendix C). One-legged interviews with eight volunteer teachers and a focus group session with the teachers that were interviewed were conducted to provide data to answer the research questions (Appendix D). One-legged interviews are interviews that start with open-ended questions such as, "What are you doing with the new innovation," and allow for follow-up questions from the researcher to dig deeper on a subject (Hall & Hord, 2001).

Theoretical Framework

The change process can be facilitated through a framework developed by Hall and Hord (2001) which articulates the change process for implementing an innovation. Hall and Hord have over 30 years of experience in research in the area of change. Their Concerns Based Adoption Model model is comprised of three tools: IC maps, SoC, and LoU. CBAM not only helps to understand the change process, but also, more precisely, helps predict the change process. By understanding people's behavior one can prevent the repercussions that occur with change (Hall & Hord, 2001). The CBAM diagnostic nature is also helpful when planning interventions. Using appropriate and purposeful resources to meet the learner's needs is one way this tool can help differentiate professional development. The CBAM model includes three diagnostic tools: (a) Stages of Concern, (b) Levels of Use, and (c) Innovation Configurations (Hall & Hord, 2001).

The Stages of Concern category includes descriptions about the stage of perceived concern and feelings for an innovation, ranging from 0 (Awareness) to 6 (Refocusing). These descriptors indicate the readiness level of the learner. Knowing this information helps to design

professional development to better meet the learners, and end user of the innovation, by addressing where they are and stretching them to the next level of learning (Hall & Hord, 2001).

Change in Schools

People within organizations deal with change in a variety of ways (Fullan, 2006). Change is learning how to do things differently but can be extremely complex, especially when dealing with significant change (James & Connolly, 2000). Teachers often look at change as personal, questioning the way they have always done things. This is especially true when the change involves implementing tools that they themselves have to learn how to use. Imposed change can often push teachers to become angry, experience denial of personal autonomy, or face anxiety of the uncertainties new technology may bring (James & Connolly, 2000). With change comes the questioning of one's practice and could instill doubt of a teacher's ability to reach students in productive and effective ways. Teachers may choose to embrace the needed change, or resist the change when it comes to technology integration within the classroom.

Hall and Hord (2006) argue that change is a process, not an event. A study conducted by Olafson, Quinn, and Hall (2005) shows concerns regarding technology integration from teachers that attended three semesters of technology classes. When a partnership with a professional development school allowed teachers to develop and utilize their knowledge of both effective teaching strategies and technology skills, the teachers were uncertain about the demands of the technology projects they were expected to complete (Olafson, Quinn & Hall, 2005). Reassuring the teachers that they would be successful over time did little to resolve their feelings of frustration. By the third semester, however, teachers could review technology products that were completed in the earlier semester. Concerns in the third semester decreased to 17 percent compared to 71 percent in the first semester (p. 95).

Other studies of the last decade have sought to identify factors that contribute to successful change in education (Fullan, 2007; Hall & Hord, 2006). Two important aspects, inappropriateness of the change itself and the lack of understanding of the complicated change process, have contributed to the failure of change within schools (Fullan, 2007). Hall and Hord (2006) stressed that implementation of change is of equal importance with agenda development, arguing that an imbalance in investment and attention has existed between development and implementation in past practice. The problem is that the top-down approach still appears to dominate throughout educational change in K-12 schools (Hall & Hord, 2006).

Human Aspect of Change

Fullan (2007) indicates that one of the main reasons for the failure of implementing educational change is that many endeavors at educational policy and program change focus on legislation, material development, and other on-paper changes, ignoring the multi-level social process involving many stakeholders, especially teachers. Hall and Hord (2006) point out that the school, as the unit of decision-making, is the primary institution of change and that an organization will not change until the individuals within it change.

While there are numerous tools that can evaluate the process of change or measure the levels of success when implementing a new program or innovation, Hall and Hord's Concerns Based Adoption Model (CBAM) allows the researcher to identify the concerns of the users themselves (Hall & Hord, 2001). In this current study, the researcher used the CBAM Stages of Concern survey in order to identify the concerns of the teachers, the end user. This allowed the researcher to identify barriers that were present and were impeding the process of change.

External and Internal Barriers to First- and Second-Order Change

Ertmer (2005) describes first-order change barriers as barriers that are often associated

with the extrinsic factors while second-order barriers are often connected to internal factors such as attitude, beliefs, and self-efficacy. Marzarno (2005) claims that both of the described barriers may impede growth when it comes to change. First-order change is change that is consistent with prevailing values and norms, meets with general agreement, and can be implemented using people's existing knowledge and skills (Waters, Marzano and McNulty, 2003). A change becomes "second-order" when it is not obvious how it will make things better, it requires people to learn new approaches, or it conflicts with prevailing values and norms (Waters, Marzano and McNulty, 2003). Second-order changes require leaders to work deeply with staff and the school community. Second-order change can disrupt people's sense of well-being and the co-operation and cohesion of the school community. They may confront and challenge expertise and competencies and throw people into states of "conscious incompetence" (Waters, Marzano and McNulty, 2003).

Identifying teachers' concerns allowed the researcher to expose the external and internal barriers that were present and possibly delay a successful change process. Fullan (2007) stressed that change is multidimensional, including at least three essential components: curriculum materials, new teaching strategies, and the beliefs behind the change. These three components can act as a first- or second-change barrier to a teacher as a new innovation is being implemented. The curriculum change, or the addition of technology innovations, can be referred to as external barriers. These barriers are what Fullan (2007) calls restructuring. This change can happen time and time again and may not challenge a teacher's approach to education. Of the three components, Fullan (2007) emphasizes that change in beliefs, or internal barriers, is the cornerstone of achieving effective and sustainable reform. Fullan (2007) indicates that reculturing, how teachers come to question and change their beliefs and habits, is what is needed

for deep change within schools. This is why substantial change is so difficult to attain but, once achieved, has a great impact. In this sense, positive mindsets from classroom teachers, in connection with the change agenda, is crucial in leading change within schools. More emphasis needs to be placed on the human side of the story regarding change (Fullan, 2007). Key players such as teachers must have a voice.

External barriers are identified as the issues that the teachers have little, or no, say in when it comes to implementing change. A number of external barriers have been identified that stand in the way of teachers being successful when integrating technology in their teaching, such as lack of hardware and software, lack of time, lack of funding, inadequate facilities, and lack of support services (Baltaci, Goktalay & Huguet, 2008; Del Favero & Hinson, 2007; Keengwe, Onchwari, & Wachira, 2008). Scholars identify teachers' aversions to risk and their attitudes toward technology integration as critical internal barriers (Mehlinger & Powers, 2002; Nicolle, 2005). While professional development and training, district and school support, and curriculum expectations and modifications have been identified in numerous studies as being central to the adoption and integration of technology (Nicolle, 2005; Watson, 2007), teacher perceptions of teaching with technology in the classroom also affects integration (Ertmer, 2005).

Technology in Schools

Technology is defined as a manner of accomplishing a task using specialized tools, processes, methods, or knowledge (Webster's, 2013). Technology can be a pencil, a piece of paper, or any tool that supports the educational process. Education has seen a tremendous change in technology tools over the past decade (Trilling & Fadel, 2009; Gray, 2014). Tools that students are exposed to today include computers, iPads, and even cell phones. While K-12 schools are slow to incorporate today's technology, many are looking at bringing in new tools to

support how students learn today (Collins, A. & Halverson, R., 2009; Quillen, 2011). Mt. Morris Consolidated Schools, a northern Genesee County School District, provides an example of how technology has progressed over the past decade and how schools are responding. Lori Banaszek, the district's technology director, explains that they are trying to meet the pressing need of updating technology to keep up with their students' interests. The district recently purchased new 3D technology software that it has installed in the high school science labs. This technology allows the students to observe and participate in interactive lessons such as dissecting a pig. The 3D technology brings the lesson alive when the students are equipped with 3D glasses, but it does not stand alone. Each classroom is equipped with a promethean interactive whiteboard, a laptop for the teacher, and a 3D projector (Personal communication, November 3, 2010)

When technology is referred to in this study, the researcher is referring to the Interactive Television Labs located in each of the four elementary schools within the school district used for this study. These innovations include a teacher computer, four student computers, distance learning capabilities, a DVD/VCR player, and an interactive whiteboard. The researcher examined the perceived barriers and the concerns of the teachers working within the school district when implementing these technology innovations into their lessons.

Definition of Terms

First-Order Change. Incremental change that fine tunes a system through small steps that do not depart radically from the past practice (Marzano, 2005, p. 66).

Second Order Change. Deep change that alters a system in a fundamental way and results in a dramatic shift in direction for the system while requiring new ways of thinking and acting (Marzano, 2005, p. 67).

Interactive Television Labs (ITVL). Classrooms within all four elementary schools in a

northern Genesee County school district that includes four student computers, teacher computer, distance learning technology, Promethean interactive whiteboard, VCR, DVD player, document camera, and a 4 x 6 screen

Technology Rich Environment. Environment such as a school or classroom that includes technology tools that can be incorporated within the daily lessons.

Technology. The new innovations within the ITVLs that each teacher has access to: Teacher computer, four student computers, DVD/VCR, distance learning capabilities, interactive whiteboard.

C.B.A.M. (Concerns Based Adoption Model). A diagnostic instrument that provides evidence of the current extent and quality of implementation educational leaders can use to drive decisions and actions.

Limitations of the Study

Important to any research study are the delimitations and limitations that establish the boundaries, parameters, exceptions, and qualifications that exist in every study (Castetter & Heisler, 1977). Limitations identify those factors that may produce potential weaknesses in the study. Limitations for this study will include:

a) Elementary teachers participated in the study on a voluntary basis only. The researcher did not require their participation, therefore limiting the number of participants;

b) The researcher worked under the assumption that the elementary teachers participating in the study gave accurate and truthful answers;

c) The data retrieved from the study covered the school years 2011-2012 when the technology was new to the schools.

d) There may have been other factors besides those within the study that influenced the

implementation of technology among the elementary teachers.

Delimitations of the Study

Delimitations are the boundaries and parameters set by the researcher and frames how the study was narrowed in scope. This study included the following delimitations:

a) The study looked at four elementary schools within one northern Genesee County school district;

b) The study was conducted in the spring of the 2011-2012 school year;

c) Participants were teachers of 1st through 6th grade students in the same district within northern Genesee County

Summary

Chapter 1 began with an introduction to this mixed-methods study that examines the perceived barriers to the ITVL technology integration among elementary teachers. The chapter continued with the statement of the problem, along with the purpose of the study. The chapter then provided definition of terms, an introduction to the study's design and methodology, which included limitations and delimitations. The CBAM model was presented in the theoretical framework, along with supportive theories. Chapter two will review the literature and conceptual framework informing the study. Additionally, the significance of the study, the purpose, and the methodology will be described in greater depth in subsequent chapters, along with the findings and the conclusions.

CHAPTER II – REVIEW OF RELATED LITERATURE

Introduction

This chapter will examine the literature of external and internal barriers, first- and second-order change, the concerns based adoption model (CBAM), and other key factors that are connected to technology integration in schools. The conceptual framework of this study is consists of key ideas that have emerged from the researcher's experiences as a teacher and administrator in various school districts. The researcher grounded the conceptual framework within the first- and second-order change theory and Hall and Hord's CBAM. The conceptual framework provided a lens through which to review the external and internal barriers that were present for teachers when integrating the technology within the Interactive Television Labs (ITVL) installed within a school district in northern Genesee County and to understand the relationship between those barriers and the teachers' stages of concern.

Theories and Models of Organizational Change

Change is a part of daily life. As the Greek philosopher Heraclitus once said, "the only thing that doesn't change is change itself." Change within organizations is also a regular phenomenon; one that requires attention in order to acquire some element of purpose. Furthermore, the ability of schools to manage and survive change has become an ever-increasing need within the current educational environment (Amagoh, 2008).

Various change theories and models exist to help make meaning of the activities that surround the complexities of how organizations mold and adapt to both internal and external forces. The theories and models that will be discussed in this literature review will be limited to change that is applied to organizations, and not social, biological, or larger change theories (Kezar, 2001).

Within the literature there are various tracks discussing models of change. Van De Ven and Poole (1995) discuss various typologies of change and categorize the following change models: life cycle, evolutionary, dialectical, and teleological. Furthermore, we can add two additional models that explore the sense-making approach from a phenomenological or social constructivist view of organizations, the social-cognition model as well as the cultural model (Kezar, 2001).

In the 1990s and throughout the 2000s theorists were less involved with the social aspect of the organization, and more interested with the management of systems and processes within organizations (Senge, 2006; Amagoh, 2008). Systems theory and complexity theory are two main outcrops of this approach. Drawn from and adapted from biology, economics, and engineering, systems theory describes how elements within the organization relate to one another and have an effect on each other and the whole; describing the inter-relationships and interdependencies on the organization (Senge, 2006). Likewise, complexity theory outlines the relationships of elements within an organization, but at a more micro-level. This theory, however, provides additional focus on the emergent order of things, in what might otherwise look like a very chaotic or complex system of behaviors (Amagoh, 2008).

In regards to the change process, more contemporary scholars are focusing on the concept of organization and personal/professional development (Kegan & Lehey, 2012). The idea of a learning organization has fused with organizational development to create an awareness that change is not a result of some external force, but a process of growth or development within the person. Therefore, understanding both the context of the change that is or is about to occur, and the individuals who are or who will experience this change is crucial to a leader's approach to managing the change process (Senge, 2006; Kegan & Lehey, 2012).

Lewin's Change Theory

Kurt Lewin (1947) identified a three-stage model of change that is known as the unfreezing-change-refreeze model. This change theory requires prior learning to be rejected and replaced. Edgar Schein provided further detail for a more comprehensive model of change calling this approach "cognitive redefinition", which is aligned to what many researchers refer to as second-order change. Lewin's model of change establishes three steps of the change process: unfreezing, unfrozen (or malleable), and refreezing (Wirth, 2004):

Stage 1: Unfreezing – becoming motivated to change. This phase of change is built on the theory that past observational learning and cultural influences affects human behavior. Change requires adding new forces for change or removal of the existing factors that are leading to the status quo behavior. The unfreezing process has three sub-processes that relate to a readiness and the motivation for people to change.

- Disconfirmation where present conditions lead to dissatisfaction, such as not meeting personal goals. However, the larger the gap between what is believed and what needs to be believed for change to occur, the more likely the new information will be ignored.
- Previous beliefs now being seen as invalid creates "survival anxiety." However, this may not be sufficient to prompt change if learning anxiety is present.
- Learning anxiety triggers defensiveness and resistance due to the pain of having to unlearn what had been previously accepted. Three stages occur in response to learning anxiety: denial; scapegoating & passing the buck; and maneuvering & bargaining. It is necessary to move past the possible anxieties for change to progress. This can be accomplished by either having the survival anxiety be greater than the learning anxiety

or, preferably, learning anxiety could be reduced.

Stage 2: Unfrozen– change what needs to be changed. Once there is sufficient dissatisfaction with the current conditions and a real desire to make some change exists, it is necessary to identify exactly what needs to be changed. Three possible impacts from processing new information are: words take on new or expanded meaning, concepts are interpreted within a broader context, and there is an adjustment in the scale used in evaluating new input. A concise view of the new state is required to clearly identify the gap between the present state and that being proposed. Activities that aid in making the change include imitation of role models and looking for personalized solutions through trial-and-error learning.

Stage 3: Refreezing – making the change permanent. Refreezing is the final stage where new behavior becomes habitual, which includes developing a new self-concept and identity and establishing new interpersonal relationships.

Kotter's Change Therory

Building on the work of Lewin, John Kotter, Professor at Harvard Business School and expert change agent, introduced his change theory in his 1995 book, "Leading Change". Kotter's change theory expanded the change process to include eight steps: create urgency; form a powerful coalition; create a vision for change; communicate the vision; remove obstacles; create short-term wins; build on the change; and anchor the changes in corporate culture (Kotter, 1996).

Step 1: Create Urgency. In the first step the leader must identify potential threats, examine opportunities, and start honest discussions to get people talking and thinking.

Step 2: Form a Powerful Coalition. In the second step, the leader must identify the true leaders in the organization, ask for an emotional commitment from key people, and work on

team building within with the change coalitions.

Step 3: Create a Vision for Change. Step three suggests the leader should determine the values that are central to the change, develop a short summary that captures what they "see" as the future, and create a strategy to execute that vision.

Step 4: Communicate the Vision. Within step four, the leader should be communicating the organization vision and talking often about it, address peoples' concerns and anxieties, openly and honestly, apply the vision to all aspects of operations – from training to performance reviews, and leading by example.

Step 5: Remove Obstacles. The next step works to establish the change by identify, or hiring, change leaders whose main roles are to deliver the change, look at the organizational structure, job descriptions, and performance and compensation systems to ensure they're in line with the vision, recognize and reward people for making change happen, identify people who are resisting the change, and help them see what's needed, and take action to quickly remove barriers (human or otherwise).

Step 6: Create Short-Term Wins. Once the change is happening, the leader should look for sure-fire projects that they can implement without help from any strong critics of the change, don't choose early targets that are expensive, as you want to be able to justify the investment in each project. Also, thoroughly analyze the potential pros and cons of the targets. If they are unsuccessful with an early goal, it can hurt the entire change initiative. Therefore, reward the people who help you meet the targets.

Step 7: Build on the Change. After every win, analyze what went right, and what needs improving, set goals and continue building on the momentum that has been achieved, and keep ideas fresh by bringing in new change agents and leaders for the change coalition.

Step 8: Anchor the changes in Corporate Culture. In this step the leaders should talk about progress every chance they get. Tell success stories about the change process, and repeat other stories that they hear, include the change ideals and values when hiring and training new staff, publicly recognize key members of the original change coalition, and make sure the rest of the staff – new and old – remembers their contributions, and create plans to replace key leaders of change as they move on.

First- and Second-Order Change and Change Barriers

Current outcomes of today's schools suggest that systematic change is necessary to instill meaningful and lasting change (Marzano, 2005). First-order changes adjust current practices, making it more efficient or effective, while leaving underlying beliefs unchallenged. For example, using a laptop to study information for a test rather than a worksheet is a first-order change. Second-order change, however, confronts fundamental beliefs about the teacher's current practice, which may lead to new goals, structures, or roles (Ertmer, P, & Ottenbreit-Leftwich, 2009). An example of second-order change in a classroom would be a teacher having the students use a social network online to discuss the story they read with fellow classmates rather than writing a book report about the story. First-order change barriers often are associated with external barriers such as equipment needs, accessibility, and training, while second-order change barriers are associated with intrinsic barriers such as the teachers' beliefs about teaching and their pedagogy (Chai & Tsai, 2012).

There are times, however, when a first-order change for one teacher may be a second-order change for another (Ertmer, 2005). Barriers to change are the extrinsic and intrinsic factors that affect a teacher's innovation implementation efforts (Ertmer, Addison, Lane, Ross & Woods, 1999). Many teachers today recognize the importance of integrating technology into the

curriculum, but their efforts are often met by both external and internal barriers. These barriers may stop first-order change for one, while halting second-order change for another.

External barriers to technology integration are described as being extrinsic to teachers and include the lack of access to computers and software, time to plan, and inadequate technical and administrative support (Ertmer & Ottenbriet-Leftwich, 2009). Many external barriers can be eliminated through purchasing equipment, by providing adequate training for teachers and students, and by creating technology rich environments for students to learn. Bauer and Kenton (2005) uncovered a number of factors which prohibit teachers from utilizing technology to its advantage. In particular, extra time, an external barrier, is needed for teachers to plan the integration of technology into the curriculum, and students need more time to work with computers.

The ITVLs installed in the four elementary schools within the school district the researcher examined, created an environment where many external barriers have been removed. Teachers often are halted in the progress of using technology innovations due to external factors that may act as first-order change barriers for implementing technology innovations into their lessons. Equipment had been installed at the four elementary schools within the district, and technology tools that were not available to the teachers before are now available. Marzano (2005) explains that first-order change barriers are often solved by the routine business of school leaders by demanding corrections and alterations.

Ertmer suggests that internal barriers to technology integration are intrinsic behaviors and the beliefs that teachers have in regards to the benefits and rationale of using technology in the classroom (2005). Unlike external barriers that may be eliminated by securing resources and training, internal barrier elimination requires challenging one's belief system about using

technology within the classroom and the organization's routines and culture. These changes are much more radical and are considered deep changes that may fundamentally change the system (Marzano, 2005). Using technology within the classroom may require teachers to reformulate basic assumptions regarding what constitutes the content they are teaching while reevaluating what comprises learning and engaged time (Snoeyink & Ertmer, 2002).

The relationship between internal and external factors in using technology within the classroom is not clearly understood. In the past, it was assumed that if second-order barriers were removed, then integration would follow (Ertmer, Addison, Lane, Ross, & Woods, 1999). Researchers find that teacher personal use of technology increases the use of technology in the classroom (Ertmer & Ottenbreit-Leftwich, 2009), yet it is unclear how this evolution relates specifically to the presence or absence of first-order and second-order change barriers. Ertmer & Ottenbreit-Leftwich (2009) stated that the weight a teacher places on external barriers, such as access to technology, time for training, and time for technology rich lessons, may be related to the teacher's own underlying internal barrier. Internal barriers are not always observed, but their presence can be a reason that a teacher becomes frustrated with external factors. Two teachers may share the external barrier of not having enough computers in a classroom. The internal barrier, however, may be entirely different once the external barrier is removed. One teacher may look at the new Interactive Television Labs as a tool to allow him or her to do more of what he or she has done for years, showing that this teacher still must break through internal factors to using technology, thus needing second-order change. The other teacher may look at the technology tools within the lab as a way to change his or her pedagogy and content. This example shows that the teacher's internal beliefs were the first-order change, and by receiving new technology tools, second-order change barriers were removed. What was a first-order

change for one may be a second-order change for another (Marzano 2005).

School leaders may assume that external barriers must be removed before internal change barriers can be addressed. There is some indication in the literature, however, that suggests internal barriers to technology use in the classroom must be addressed prior to, or in conjunction with, the removal of external barriers (Kershaw, 1996). Effectiveness at implementing technology innovations requires a different learning perspective and a meaningful change on the part of the teacher. "The crucial point is that it is not the professional development per se, but the experience of successful implementation that changes teachers' attitudes and beliefs. They believe it works because they have seen it work, and that experience shapes their attitudes and beliefs" (Guskey, 2002, p.383). The researcher hoped to gain knowledge of the elementary teachers' concerns regarding implementing technology innovations into their lessons and the relationship between those concerns and the external and internal barriers that are present.

Removing Barriers

Technology rich environments alone cannot remove barriers. These barriers need to be continuously examined as technology continues to change at a vigorous pace throughout schools. The proliferation of the Internet and the increase of computers in schools have, in many cases, removed the external barrier of accessibility. The addition of the ITVLs in the four elementary schools studied created an environment within the schools in which access to the latest cutting edge innovations was available. In spite of the availability of the cutting-edge technology, many external and internal barriers will still present obstacles to effective integration of these labs into the daily instruction. Although research has been done to learn about the impact of placing technology in schools, technology has progressed to such an extent that more research must be completed. Understanding the perceived external and internal barriers and the concerns of the

elementary teachers when implementing the ITVL's in lessons enabled district and county leaders to make necessary changes to remove these barriers and work toward the successful integration of the ITVLs into the curriculum. Ertmer and Ottenbreit-Leftwich (2009) agreed with the significance of understanding obstacles, stating.

> "...teachers have been shown to be conservative as a group. They tend to rely on traditional teaching methods and 'reflexively resist' curricular and instructional innovation. Although teachers might believe that technology helps them accomplish professional and/or personal tasks more efficiently, they are hesitant to incorporate the same tools into the classroom for a variety of reasons including the lack of relevant knowledge, and existing belief systems" (p.2).

Integrating technology into teaching is a difficult and complex process and could encounter many hurdles to jump. Although barriers have been studied, measured, and labeled differently, researchers have identified common stumbling blocks within the educational setting (Rogers, 2000; Bariso, 2003). Lack of computers, lack of quality software, lack of time, and poor administrative support are examples of the external barriers that are found to be common among teachers. To become more familiar with the common obstacles for implementing technology, studies have been conducted to observe teachers that have been successful in creating twenty-first century learning environments. One of these studies, conducted by Hooper and Reiber (1999), described five phases of teachers' use of technology: (a) familiarization, (b) utilization, (c) integration, (d) reorientation, and (e) evolution. The study alleged that teachers rarely leave the utilization stage. In this stage, teachers become satisfied with their limited use of technology but do not embrace the commitment to the tools and their purpose. They tend to discard the technology at the first sign of trouble. Real change occurs when teachers consciously

decide to designate certain tasks and responsibilities to technology, so much that the lesson fails if the technology fails (Hooper & Reiber, 1999). The integration stage is when teachers make real change in their teaching style and meet the needs of their students through technology. This study concluded that teachers at each level were faced with obstacles that either deterred them from moving forward or slowed the process. These barriers included time, skill level of staff and students, difficulties with equipment, and scheduling.

Rogers (2000) studied barriers as two separate categories, external and internal. Internal barriers are those based on teacher attitudes and skill level, while external barriers include technology support or access to technology tools. Beaudin (2002) investigated barriers of technology integration at the kindergarten through twelfth-grade level. External barriers such as time and poor accessibility were highly visible. A study conducted by Snoeyink and Ertmer (2002) showed that technology-novice teachers display a pattern of responsibility shifting. They asserted that teachers blamed their lack of computer use on external barriers rather than accepting responsibility for themselves or the second-order change barriers.

The literature review points to a need to look closely at the elementary teachers' perceived external and internal barriers and the concerns that may undermine the implementation of the ITVL's into their daily lessons. Studies over the course of the last ten years show technology becoming increasingly important in the classroom but also shows the gap is becoming bigger in implementing the tools for teaching and learning.

Concerns Based Adoption Model

The Concerns Based Adoption Model (CBAM) is a change model in which relationships between users and the resource system of an innovation can be examined. For this study, the resource system was the ITVLs in which the Intermediate School District and the northern

Genesee County school district's partnership allowed for the innovation. The users are the elementary teachers at the four elementary schools located within the school district that were studied. The researcher conducted the study of the perceived barriers and concerns to technology implementation through the lens of the CBAM stages of concern to better understand the steps that were taken by elementary teachers to endure both first- and second-order change as it relates to external and internal barriers.

The three diagnostic tools of the CBAM user system are the Stages of Concern (SoC), Levels of Use (LoU), and Innovation Configurations (IC) (Hall & Hord, 2001). Innovation Configurations (IC) address the well documented fact that each implementer does not necessarily use the same operational form of the change. Teachers involved may say they are using the technology but what is in operation within each classroom and school can be significantly different (Hall & Hord, 2011). Levels of Use (LoU) describes a set of behavioral profiles that distinguish different approaches to using an innovation. Hall and Hord (2011) have identified three different non-user profiles have been described and five different user profiles. Each of these has been defined in terms of behaviors and each has implications for how to facilitate change and for evaluating change success and effectiveness.

The SoC dimension of the CBAM was most relevant to this study as it focuses on change during initial innovation adoption from the perspective of the individuals involved in the change and can be used as a tool for continued examination of the innovation adoption. The SoC questionnaire includes a set of scales to prepare a numerical and graphical representation of the types and strengths of participant concerns toward the innovation. The SoC dimension utilizes three data collection tools to identify individual and group concerns about an innovation (Hall & Hord, 2001). Concerns were identified through one-legged interviews, focus groups, and Stages

of Concern Questionnaires. The CBAM focuses on how individuals react to innovation and identifies very distinct stages they experience as they move from awareness to implementation (Sweeny, 2003, pp.1-2). The three components of the CBAM tools can be described by the following table:

Response To:	CBAM	Measurement
Who	Stages of Concern Questionnaire (SoCQ)	Individual concerns about an innovation
How	Levels of Use (LoU)	Individual use of innovation
What	Innovation Configuration (IC)	Identifies forms of innovation

Figure 1. Concerns Based Adoption Model (CBAM) Tools. This figure provides the three main tools that compose the CBAM model, their response, and level of measurement.

The Stages of Concern includes the unrelated level, impact level, self-level and task level of concerns (Hall & Hord, 2011). The unrelated level consists of only one stage (awareness stage) in which the individual has no concerns about the innovation. At the opposite end of the continuum, the impact level has three stages (consequence, collaboration, and refocusing stages) and shows the individual progressing from being less concerned about the innovation's impact on him/her as an individual and being more global in his/her concerns. Between these levels are the self and task levels. Individuals at the self-level (informational and personal stages) of concern have not necessarily fully adopted the innovation. Individuals at a task level (management stage) may be asking themselves about ways to best organize their time to allow for innovation use (Hall & Hord, 2001). Additionally, the individual in a Management stage may have concerns about taking full advantage of resources and materials that are associated with the

innovation (Hall & Hord, 2001). In the case of this study, elementary teachers at this stage, within the school district studied, may be concerned about having enough time to fully explore the potential of using the ITVL's to best meet the learning needs of the students. The seven stages of concern can be described by following table:

Stages of Concern	Expression of Concern
6. Refocusing	I have some ideas about something that would work even better
5. Collaboration	How can I relate what I am doing with what others are doing?
4. Consequence	How is my use affecting learners? How can I refine it to have more impact?
3. Management	I seem to be spending all my time getting materials together
2. Personal	How will using it affect me?
1. Informational	I would like to know more about it
0. Awareness	I am not concerned about it

Figure 2. Concerns Based Adoption Model (CBAM) Stages of Concern. This figure illustrates the 7 states of concern and provides how each stage is expressed.

The CBAM is a reliable and valid tool for an educational researcher (Hall & Hord, 2001, 2011). George, Hall, & Stegelbauer (2006) discussed the history surrounding the reliability and validity. Beginning in 1973 for a three year period in which the SoCQ was critically scrutinized. Beginning with 544 questions, which were eventually refined to a 35 item questionnaire, "The resulting SoCQ was tested for estimates of reliability, internal consistency, and validity with several samples and 11 innovations" (George, Hall, & Stegelbaurer, 2006 p. 11). From 1974 through 1976, tests were conducted to determine the SoCQ's validity. The authors discuss the

work, pointing to the overwhelming results indicating validity, as well as follow-up procedures that explain any anomalies in the validity studies (Hall & Hord, 1987). Likewise, a detailed account of reliability studies is provided in the SoCQ manual, which indicates that the questionnaire is comprised of a high degree of internal reliability. The three tools can be used in conjunction with one another or separately (Hall & Hord, 1987). Depending on the researcher's purpose of study and desired outcome, each tool serves a different purpose. The researcher, for this study, was interested in looking at the perceived concerns of the innovation. Because the researcher was interested in the concerns of the teachers about the innovation itself, the Stages of Concern Questionnaire lends itself to be a valuable tool for obtaining data on how the teachers perceive the first- and second-order change barriers in relation with the ITVL's. The researcher used the SoCQ independently and did not employ the LoU or the IC Map tools.

Change in Schools

Fullan (2005) explained that individuals deal with change differently. Although teachers may all have a different acceptance to change in schools, change for them is often personal and can cause frustration when it involves implementing a new innovation that they have to learn how to use. Imposed change can often push teachers to become angry, experience denial of personal autonomy, or face anxiety of the uncertainties new technology may bring (James & Connolly, 2000). Questioning one's practice often comes with change and could instill doubt of a teacher's ability to reach students in productive, effective ways. Teachers may choose to embrace the needed change or may resist the change when it comes to technology integration within the classroom.

Change is not a singular event, but a processes (Hall and Hord, 2006). As Olafson, Quinn, and Hall (2005) described, there are legitimate concerns regarding technology integration

from teachers that need to be addressed for successful change to take place. Just reassuring teachers that the change will be successful did little to the actual implementation. Therefore, a keen understanding of the complicated change process is crucial for leadership (Fullan, 2006). Fullan (2007) further indicates that the focus on legislation, material development, and other on-paper changes ignores the multi-level social processes of the teachers. Getting the teachers involved in the change processes and addressing the real and legitimate concerns should be a primary concern of the leader (Hall and Hord, 2006).

One of the tools that can evaluate the process of change or measure the levels of success when implementing a new program or innovation is the Concerns Based Adoption Model (CBAM) (Hall and Hord, 2001). This model allows the researcher to identify the concerns of the teachers, the end user, seeking to identify barriers that were present throughout the change processes.

Technology and Innovation

Educational organizations respond in a variety of ways to change in technology and culture, from hesitance to enthusiasm (Liu, Ritzhaupt & Cavanaugh, 2013). Increasingly, students, parents, administrators, and communities are expecting schools to adopt technology as an integrated tool in education (Liu, Ritzhaupt & Cavanaugh, 2013). Changes in technology and innovative practices create an environment of adaption for students and teachers to real world expectations. Technology integration and innovative shifts form situations where all stakeholders experience change in practice and mindset.

The importance of technology and innovative practices has been greatly emphasized in teacher training and professional development (Lawless & Pellrgrino, 2007). Adoption of technology integration and innovative practices requires focusing on the end user, the teacher

(Kim, Kim, Lee, Spector & DeMeester, 2013). Deeper and more meaningful ways for stakeholders to engage with change are needed (Weston & Brooks, 2008), while rational planning and needs assessments are crucial in integrating technology tools and new innovations in schools (Bain, 2007).

Christensen, Horn, and Johnson's book, *Disrupting Class: How Disruptive Innovation Will Change the Way the World Learns* lays out the importance of innovative practices and the role technology plays in today's classroom (2008). The authors state that the way we learn doesn't always match with the way teachers teach. Their research points to a reality that if we hope to stay competitive in a fast changing world, we need to reevaluate our educational system, rethink our approach to learning, and reinvigorate our commitment to learning (Christensen, Horn, & Johnson, 2008). For the past thirty years, researchers have noticed a trend in students being bored, exceling in one class and struggling in others, and becoming apathetic to learning (Christensen, Horn, & Johnson, 2008). The authors contend that the standardized model of schooling must be changed in order to customize learning for all types of leaners. To do this, schools must move toward a technology rich, computer based system in order to personalize instruction (Christensen, Horn, & Johnson, 2008). Technology can help meet the needs of every learner and reflect the importance of Gardner's work of the eight intelligences.

Technology in Schools

The ever-changing classroom that is needed in today's schools is growing at a slow pace due in part to second-order change barriers. These barriers go beyond the observed external and internal barriers such as tools, training, and attitudes. Teacher attitudes toward technology and their utilization within schools are related to how and why they use technology for educational purposes (Norris, Sullivan, Poirot & Soloway, 2013). Providing teachers with the tools they

need is crucial. However, first-order changes do not always equate to educational use (Muir-Herzic, 2004). The ITVL's removed certain external barriers for the teachers in addressing tools, access, and initial training. The four elementary schools that were examined have a technology rich environment for students. The literature shows that when used properly, technology rich environments are beneficial for learning (Wagner, 2008, Trilling & Fadel, 2009).

Smoekh (2008) describes three technology-rich schools that enabled teachers to adopt technology in pedagogically meaningful ways. According to Smoekh, school-wide innovation occurred in situations in which "the principal's vision and motivation were of central importance" (p.457) and the innovation led to a "change in the nature of teacher-teacher relationships, based on collaboration and mutual support" (pp.457-458). Additionally, all three schools were noted as having these characteristics:

1. They were well equipped in technology.
2. Their focus was on changing the process of learning the technology.
3. Skills were acquired as part of the process of using them purposefully.
4. They provided support.
5. Teachers had opportunities to discuss problems with their peers and facilitators and explore solutions over time (Smoekh, 2008).

Educational researchers, especially those who have examined large numbers of controlled studies (meta-analyses) that were neutral and independent, agree that if used appropriately, technology can improve student learning (Kulik, 2002; Waxman, Connell, & Gray, 2002). Other research supports that student achievement can increase when practicing authentic inquiry and higher order thinking, and when technology is present in the teaching environment, the benefits are enhanced (Cennamo, K.S., Ross, J.D. & Ertmer, P.A. 2010; Collins, A, & Halverson, R.,

2009; Cuban, L. Kirkpatrick, H. & Peck, C., 2001; Ertmer, P, & Ottenbreit-Leftwich, 2009). The act of integrating technology in isolation, however, does not necessarily result in the acquisition of higher order thinking skills or improved student achievement. Positive results depend on how the technology is used and the role the teacher plays in the classroom (Marzano, 2005). When technology is effectively integrated into subject areas, teachers grow into roles of adviser, content expert, and coach. Technology helps make teaching and learning more meaningful and fun (Bender & Waller, 2012; Jacobs, 2010; November 2010).

Technology in the Classroom

To understand the potential of technology implementation within the classroom to enhance the teaching-learning process, the impact of technology on classroom practices has been studied by many researchers (Wagner, 2008, Trilling & Fadel, 2009, Jacobs, 2010). A complementary relationship appears to be present between using technology in the classroom and meeting the needs of today's learners. Jacobs (2010) and November (2010) claim that technology is a powerful tool to facilitate this learning. Meaningful learning is learning through which students are engaged in lessons that include authentic problem-solving activities. Technology tools can be utilized to enhance opportunities for students to work together and solve problems (Jacobs, 2010).

Embedded in the recent research is a belief that technology integration will not only improve student learning but will prepare them for the future. State Educational Technology Directors Association (SETDA) pointed to reasons technology boosts relevant learning in the classroom. The organization's "Class of 2020: Action Plan for Education" notes that every child deserves a high quality, 21st century education. In their comprehensive plan, the directors state nine reasons why teachers should be delivering an education that incorporates technology

(SETDA, 2010):

1. To ensure that technology tools and resources are used continuously and seamlessly for instruction, collaboration, and assessment.
2. To expose all students (pre-K through 12th grade) to STEM fields and careers.
3. To have ongoing, sustainable professional development.
4. To provide virtual learning opportunities for students to further their learning through online communities and education portals.
5. To incorporate innovative, consistent, and timely assessments into daily instruction.
6. To strengthen the home-school connection by using technology to communicate with parents on student progress.
7. To provide the necessary resources so that every community has the infrastructure to support learning with technology, including assessments and virtual learning.
8. To obtain societal support for education that uses technology from all stakeholders– students, parents, teachers, state and district administrators, business leaders, legislators, and local community members.
9. To increase available funding for the e-Rate so that schools can acquire telecommunication services, internet access, internal connections, and maintenance of those connections.

Technology rich environments within a school district, such as the ITVLs, can be successful in preparing students for a global workforce. The classrooms that have evolved into technology rich environments are those that are student-centered, replacing what in many cases are teacher-centered classrooms that do not promote twenty-first century educational beliefs. Technology cannot change these environments by simply being present. Other factors, such as

the teacher's ability to use proper pedagogy, play an important role.

Technology Implementation

Teachers' beliefs about classroom practice appear to have a direct connection to their goals for technology use as well as the weight they assign to different barriers (Ertmer, 1999). Both external and internal barriers often hamper successful technology implementation (Ertmer, 2005). External barriers include limited equipment, training, and time. Internal barriers confront beliefs about current practice and lead to new goals, structure, and roles. These barriers are intrinsic to teachers and include beliefs about teaching, beliefs about computers, established classroom practices, and unwillingness to change (Ertmer & Ottenbeit-Leftwich), 2009). Changing pedagogy requires more than just time to investigate new methods and innovations, it also includes a commitment to try new things (November, 2010). Teachers' resistance to change is primarily due to their concerns regarding the influence of instructional technology integration on their preparation, beliefs, and values. Long-term change takes place when teachers take ownership in a new instructional strategy or technological innovation. To successfully implement the integration of a new technological innovation, consideration of what the implementation will mean to teachers' personal beliefs and values is of great concern (Wetzel, 2002).

Ertmer (1999) examined seven primary teachers' beliefs about the role of technology in the elementary classroom. Using interviews, she asked teachers to describe the role technology should play in the classroom, their goals for technology use, and examples of successful computer use. She found that teachers use technology as a supplement. It is used as an incentive for students to finish work or as a reward for the completion of assigned work. Technology was considered to be additional or supplementary to the existing curriculum. These teachers also

made reference to how technology supported their curriculum by reinforcing skills or providing students with extra practice. Teachers in this study made few references to using technology to go beyond current curricula. There was no emerging use of technology, using technology to take the curriculum in new directions.

Ertmer (1999) further reports what teachers cited as five main reasons they used computers in their classroom: (1) how exciting and motivating computers were for their students; (2) how students needed to use technology to be prepared for the future; (3) how technology made their lessons more interesting to students; (4) how technology enabled them to reach students with learning or attention problems; and (5) their own enjoyment in using technology and becoming more competent. Teachers' beliefs about classroom practice appeared to shape their goals for technology use as well as the weight they assigned to external and internal barriers.

Influencing teachers' beliefs about integrating technology is one possible answer to implementing fundamental technological changes in the classroom (Sugar, 2002). Sugar suggests the adoption of human-centered design principles and their corresponding philosophy as a plausible solution to affecting teachers' beliefs on the use of technology and can be a vehicle to changing their existing beliefs. The term *human-centered* is synonymous with terms such as *user-centered* and *learner-centered*. With this newly adopted human-centered attitude, teachers will more readily integrate old and new technology innovations into their lessons. If teachers are not convinced that student outcomes will improve through the use of technology, they have less incentive to incorporate it.

Prior Research

As it is with the field of technology itself, the research on technology integration in

schools is still emerging. Even finding a clear standard definition of technology integration in K-12 schools is a difficult pursuit (Bebell, Russell, & O'Dwyer, 2004). For some, technology integration was understood and examined in terms of types of teachers' computer use in the classrooms, such as presentations or collecting and interpreting data (Cuban, Kirkpatrick, & Peck, 2001). For other scholars, technology integration was examined in terms of how teachers used technology to carry out familiar activities more reliably and productively (Hennessy, Ruthven, & Brindley, 2005). Others consider technology integration in terms of teachers using innovations to develop thinking skills (Lim, 2007). The researcher in this study has established the definition of technology integration as the use of the innovations within the ITVLs to deliver instruction and for student use in their learning.

Although research studies in education show that use of technology can help student learning, certain barriers generally affect its use (Hew & Brush, 2007). From the first motion picture in 1922 to the dawn of the computer in 1972, to new innovations such as Google Glass in 2014, educators have been researching the potential of technology as a change agent in schools. Research studies in education demonstrate that the use of technology can help students' achievement scores, improve their thinking skills, and improve motivation (Hew & Brush, 2007). Technology has increased the number of ways teachers teach, students learn, and schools operate. This belief that technology can affect teaching and learning has led many organizations and educators to research its effect on K-12 schools.

Prior research in technology integration has focused on a variety of topics including barriers to implementing technology. The researcher studied a number of studies that exposed barriers for teachers, students, and school districts as a whole. Studies have shown that the lack of resources is prominent when it comes to stifling technology integration in schools (Hew &

Brush, 2006). Lack of technology includes insufficient computers, software options, and peripherals (Karagiorgi, Y., & Symeou, 2005; O'Mahony, 2003). Without adequate hardware and software, there is little opportunity for teachers to integrate technology into the curriculum.

Knowledge and skills are important aspects of integrating new technology in the classroom. Lack of technology knowledge and skills is a common reason teachers give for not using technology in the classroom (Ertmer & Ottenbreit-Leftwich, 2009). Although teachers might believe that technology helps them accomplish professional tasks more efficiently, they hesitate to integrate the tools into the classroom for a variety of reasons including the lack of relevant knowledge (Lawless & Pellegrino, 2007), low self-efficacy (Mueller et al., 2008), and existing belief systems (Ertmer, 2005; Hew & Brush, 2007).

Another barrier related to the lack of skill and knowledge is the unfamiliarity of proper technology pedagogy. Hughes (2005) reported that teachers need to hold a technology supported pedagogy knowledge and skill base before they can plan a lesson and implement technology into their classroom. The study pointed to three categories in which technology functions in a school (Hughes 2005). Technology functions as: (a) replacement, (b) amplification, or (c) transformation (Hew & Brush, 2007). Technology as replacement refers to the innovation simply replacing a tool and functioning in the same manner. For example, using a power point slide in place of a poster for a presentation. Amplification involves the use of technology to accomplish tasks more efficiently without altering the task (Hew and Brush, 2007). To amplify, student may use a word processor to write a story and have the ability to peer edit without hand writing the start over and over again. Transformation points to using technology to provide innovative educational experiences (Hughes, 2005). The technology offers opportunities to reorganize and shift students' cognitive processes and problem solving skills (Hughes, 2005).

Cennamo, Ross, and Ertmer (2010) showed that in order for technology integration to occur in the classroom on a daily basis, teachers need the knowledge to:

- Identify which technologies are needed to support specific curricular goals
- Specify how the tools will be used to help students meet and demonstrate those goals
- Enable students to use appropriate technologies in all phases of the learning process including exploration, analysis, and production
- Select and use appropriate technologies to address needs, solve problems, and resolve issues related to their own professional practice and growth (p. 10)

Once barriers such as proper resources, technology knowledge and skills, and other supports that may be in place are conquered, it is not a guarantee teachers will be successful in integrating technology. These barriers, which are referred to as first-order changes, are often met with resistance due to the second-order changes that are needed including mindsets and habits people form based on organizational and cultural expectations (Ertmer, 2009). Beliefs and attitudes of teachers can be major barriers to technology implementation (Hermans, Tondeur, Valcke, & Van Braak, 2006). Beliefs about technology integration will determine a teacher's attitude toward the proposed change (Ertmer, P. A., & Ottenbreit-Leftwich, A., 2010). Ertmer (2005) argued that the decision of whether and how technology is used depends on the teachers themselves and the beliefs they hold about technology.

Other technology integration studies have focused on the change models of the organizations and not so much on the results of the technology integration itself. Hennessy (2005) found that a feeling of disempowerment among teachers often follows a top down model that includes policies being created to force change. In order to have deep, meaningful changes, organizations must include teachers being part of the change process (Hall & Hord, 2006). Lim

and Khine (2006) found in their study of four schools that a shared vision and technology integration plan created a clear and precise pathway in integrating new technology tools and pedagogy.

School leaders play a key role in organizational change and how successful technology integration is within their schools. Hall and George (1999) studied principals and their role in being the change facilitator. The different approaches a principal uses can influence a teacher and the behavior of the whole staff (Liu, Ritzhaupt, & Cavanaugh, 2013). Adopting new technology and innovative practices can be a difficult process and create barriers for teachers (Liu, Ritzhaupt, & Cavanaugh, 2013). Crowson and Morris (1990) pointed out that by acknowledging the concerns of the teachers and supporting them through the stages of change can motivate them to take risks (Liu, Ritzhaupt, & Cavanaugh, 2013). Assessing the teachers' attitudes and concerns regarding change is crucial in successful technology implementation (Hall & Hord, 2006). A number of assessment tools have been used in educational research studies. Examples include the Organizational Culture Assessment Instrument (Cameron and Quinn, 2006), the Teacher's Attitudes Toward Information Technology Questionnaire (Christenson and Kneszek, 2000), and the Concerns Based Adoption Model (Hall & Hord, 2006).

Summary

This chapter discussed the literature review of the theories of change, first- and second-order change, the barriers of technology integration, and the Concerns based Adoption Model. The theory of change in schools, along with technology in schools and technology implementation was also discussed. This chapter was written for the purpose of setting the foundation in which the researcher was working from in conducting this study. Chapter 3 will discuss the methodology the researcher used to study the concerns and barriers of technology

integration among elementary teachers within a school district in Genesee County.

CHAPTER III – RESEARCH DESIGN AND METHODOLOGY

Introduction

Today more than ever, technology is playing a vital role in field of education; connecting students to key learning opportunities. With the surplus of information available on the Internet, and innovations making technology devices increasingly portable, schools are presented with many new opportunities for enhancing and supplementing classroom instruction through technology (Gray, 2014). As Internet availability and computer access increase, and more powerful technology costs decrease, technology driven resources are an attractive part of a school-wide instructional strategy (NCES, 2010). Furthermore, advancements in technology in the past decade have led to the development of what is called "adaptive technology," portable interactive software that help students learn anywhere, anytime (NCEE, 2006).

Not only is today's technology versatile, it is capable of engaging students in instructional activities to increase learning and helping them solve complex problems to enhance their cognitive skills (Newby, Stepich, Lehman, & Russell, 2000). Technology integration also provides positive effects for the cognitive and affective domains, as compared to more traditional instructional methods (Bender & Waller, 2012).

Yet, with all the positive attributes of using technology as an instructional support and the increase in available technology in the classroom, it's not being fully utilized (Bender & Waller, 2012). And although many districts have invested heavily in technology infrastructure, the literature suggests that technology has not had a huge impact on classroom instruction (Collins & Halverson, 2009). While much of the research points to technology in schools benefiting students, many schools that have integrated laptop computers and other digital devices into learning are not following the paths necessary to maximize its use in ways that will raise student

achievement (Ash, 2011). Leslie Wilson, co-author of the study *Technology Factor: Nine Keys to Student Achievement and Cost-Effectiveness,* states, "We all know that technology does things to improve our lives, but very few schools are implementing it properly" (p. 10). Research in the effective integration of technology and its effects on student achievement is crucial when it comes to moving schools forward in the 21st century.

Research Tradition

Technological advances continue to create new opportunities for technology use in classrooms to improve learning and instruction. As a result, there are increasing demands on teachers to develop skills necessary to use technology in effective ways (Ertmer, Conklin, Lewandowski, Osika, Selo, & Wignall, 2003). Whether school districts are purchasing more devices or moving to a "bring your own device" policy, technology continues to play an important role in ensuring students are acquiring 21st Century skills. While technology is becoming more prevalent within our public schools, it is not necessarily being implemented in meaningful or constructive ways. Over the last twenty years there have been multiple studies exploring both the barriers to technology integration in classrooms and the effectiveness of technology on teaching and learning (Huberman, 1984; Fullan et al., 1991; Rogers, 1995; Elsworth, 2000; Ward et al., 2002; Llorens et al., 2002; Baylor et al., 2003; Baylor et al., 2005; and Kim et al., 2006a, 2006b).

Prior research has shown a variety of factors around technology integration in schools, including a lack of proper teacher education (Ward, West, & Isaak, 2002). Llorens and colleagues (2002) suggested that teacher education with regard to technology integration should go well beyond teaching technical skills. Specifically, training and education should take into account teacher motivation regarding the use of technology (Llorens, Salanova, & Grau, 2002).

Motivation, creating purpose, and removing barriers for the end user is crucial in technology integration. Prior research where the adoption of an innovation in the classroom is a desired outcome, the concept of a leader as the change agent is significant (Fullan & Stiegelbauer, 1991; Rogers, 1995). As an individual who facilitates the diffusion of an innovation for potential adopters, the leader is a key role in efficacy of the intended change (Rogers, 1995). The concept of the leader as a change agent has been highlighted in the context of educational technology innovations (Ellsworth, 2000; Huberman & Miles, 1984). Four major aspects of this role have been identified: (1) an expert who provides information, (2) a mentor who advises, (3) a motivator who encourages, and (4) a companion who collaborates (Baylor & Group, 2003; Baylor & Kim, 2005; Kim & Baylor, 2006a, 2006b). Therefore, understanding the end users, the teachers, and identifying the school leader as the change agent is important in creating both meaningful and sustainable technology integration.

Research Design

This research used both a qualitative and quantitative approach, known as a mixed-methods study. The mixed-methods approach provides strengths that offset the weaknesses of both quantitative and qualitative research and allowed the researcher to answer questions that separately each approach could not (Creswell & Plano-Clark, 2007). The researcher was able to collaborate across the sometimes adversarial methods to gain a better insight into the perceived barriers of each participant.

The mixed-methods design is lesser known than either the quantitative or qualitative strategies that have been used for decades (Creswell 2009). This strategy, first used in 1959, is being used more for research within the field of education. The mixed-methods approach involves collecting and analyzing both quantitative and qualitative data in a single study.

> A mixed-methods design is useful to capture the best of both quantitative and qualitative approaches. The researcher bases the inquiry on the assumption that collecting diverse types of data best provides an understanding of a research problem. The study begins with a broad survey and parental involvement documents to generalize results to a population and then focuses, in a second phase, on detailed qualitative semi-structured interviews and parental involvement documents to collect detailed views from participants. (Creswell, 2003, p. 21)

A mixed-methods approach is the best design to address both the qualitative and quantitative research questions in this study. This strategy finds both explanations and exploration for understanding the research in depth. Research claims are also stronger and have a greater impact when based on multiple methods. Quantitative data can be persuasive to policy makers and qualitative research provides stories that can be used for illustrative purposes (National Research Council, 2002).

Research Questions

The mixed-methods study focused on the perceived external and internal barriers and the concerns that are present during the integration process of new technology from the perspectives of the elementary teachers relating to the Interactive Television Labs (ITVL). The researcher gathered information in order to understand how these barriers undermine the teachers' use of the new technology by asking the following questions:

RQ1 (Quantitative): What are the stages of concern of elementary teachers when implementing the new technology innovations within the ITVLs?

RQ2 (Qualitative): How do perceived barriers affect the implementation of the new technology within the ITVLs?

Research Instruments

The first mode of inquiry for this study was quantitative in nature while a deeper understanding by the researcher was constructed through qualitative methods. This mixed-methods approach is justified by Berg (2001) who states, "By combining several lines of sight, researchers obtain a better, more substantive picture of reality" (p.4). This study was designed to reveal what barriers were present when implementing technology within one school district and the relationships between those barriers and the concerns of the teachers. Interviews and a focus group session with eight individual teachers allowed the researcher to better understand what barriers were in place.

Quantitative Instrumentation

There are many benefits to using a web-based questionnaire when seeking feedback for research purposes (Anderson and Kanuka, 2003). A web-based questionnaire is convenient, relevant to teachers' everyday tasks, and allows participants to answer questions when and where they are most comfortable. A web-based questionnaire was used to collect quantitative data in this study (Appendix C). The design of the web-based questionnaire was taken from the Concerns-Based Adoption Model (CBAM) model and revealed the perceived barriers that are present. The web-based questionnaire investigated the teachers' stages of concern when integrating technology within the Interactive Television Labs. Prior research in technology integration has established that a questionnaire can measure these variables under examination (Mills, 2004; Newhouse, 2001).

Qualitative Instrumentation

Qualitative research, broadly defined, means "any kind of research that produces findings not arrived at by means of statistical procedures or other means of quantification" (Strauss and

Corbin, 1990, p. 17). There are many strengths for using a qualitative method when studying the very people that are expected to make the changes that the organization sets out to make. A qualitative method focuses on naturally occurring, ordinary events in a natural setting (Miles and Huberman, 1994). This study served as an attempt to gather information about the relationships among key variables in regards to the integration of technology by the elementary teachers. The study focused on the affective, reported behavioral aspects of the integration process from the perspectives of the elementary teachers as they relate to the ITVLs.

This approach allowed the researcher to observe and discuss real life situations as they pertained to the integration of technology in the ITVLs. The study was descriptive, correlational, and explanatory under the grounded theory tradition. Glaser and Strauss (1967) developed this research process that takes the researcher close to the real world situation to ensure that the results are grounded in the social world of the teachers being studied. Interactions were observed as they naturally occurred.

After the web-based questionnaire was sent out to the elementary teachers, data were analyzed and teacher profiles were created. Teachers were given the opportunity to volunteer for the qualitative research, individual interviews and a focus group session (Appendix D). The qualitative approach allowed intense, extended contact with people to learn how they produce meaning in a particular environment from common situations (Miles & Huberman, 1994). In this study, participant interviews were conducted in order to gain a deeper understanding of the perceived barriers that are present in integrating the technology within the ITVLs. The focus group provided further insight into the variables that the survey and participant interviews provided by allowing for a cross grade level, cross district discussion, thus adding more depth to the study.

The researcher used a case study approach that took place within one school district inside northern Genesee County. Yin (2003) defines a case study as

> an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident. In other words, you would use the case study method because you deliberately wanted to cover contextual conditions – believing that they might be highly pertinent to your phenomenon of study. (p. 13)

The data collected by the researcher and the process in which it was collected helped the researcher to understand which barriers exist for the elementary teachers within the school district when integrating technology in the ITVLs into their daily lessons.

Population and Selecting Participants

The targeted population for this study was approximately 100 elementary classroom teachers in grades 1st through 6th across four elementary schools within one school district. The school district is located in northern Genesee County and educates approximately 4200 K-12 students. In addition to the four elementary schools, the school district has a middle school and a high school. Classroom teachers refer to a staff member that has a classroom consisting of 25 to 31 students that they deliver instruction to during the majority of the school day. The classroom teachers in each school are responsible to teach all subjects unless they are in team teaching groups. If the teachers are team teaching, they are responsible to teach three subject areas. Team teaching environments are not unusual at the four elementary buildings at the 4th through 6th grade levels. All classroom teachers have access to the ITVLs. The school district was chosen for the study due to accessibility to the researcher and the consistent timing of the ITVLs being brought into each elementary school.

Each elementary school within the school district has approximately 450 to 500 1st through 6th grade students and consists of two or three classrooms at each grade level. A principal is assigned to each school, along with a school home coordinator that functions as an assistant principal. Each school has a computer lab that all classrooms are assigned to use one hour per week. These labs are used for software- based individualized math and reading instruction. The staff at each school includes teachers with a variety of years' experience, age, college degrees, professional development training, and interests. Using all four elementary schools allowed for what Miles and Huberman (1994) describe as increased generalizability that provides an opportunity for more sophisticated descriptions, more powerful explanations and help in answering questions."

The sample size for the participants in the web-based survey was approximately 100 teachers. Every 1st through 6th grade teacher received the web- based questionnaire via school email. Interviews were conducted with classroom teachers who volunteered for them. No general demographic data such as gender, age, or years of service were collected because those variables were not useful in providing technology integration recommendations. The researcher believed that it was more valuable to learn about the stages of concern of the teachers and the perceived barriers that are present. Background information and more detailed profiles were created for the eight teachers interviewed.

The teachers that were invited to participate in the CBAM survey all possess at least a bachelor's degree and a teaching certificate, and have some sort of technology competency. The district has a technology plan that calls for teachers to use email, Outlook calendar, and other technology tools such as PowerPoint. While technology skills vary among the teachers, all teachers possess at least a small amount of skill when using technology.

Data Collection

Overview

The researcher used various instruments to collect data for this study. The strategies adopted for this mixed-methods study are described later in this chapter. This study used multiple sources of data, including an online survey (Appendix C), individual teacher interviews, and a focus group interview session (Appendix D). The researcher carried out the data collection techniques in a manner that ensured the confidentiality of the teachers interviewed. It was crucial that the data collection techniques were properly completed due to the multiple sources of evidence collected in order to strengthen the findings and conclusions of the study.

Yin (2009) describes three principles of data. He indicates that if these principles are applied correctly, it will help to support the construct validity and reliability of the case (Yin, 2009). The principles are the use of multiple sources of evidence, development of a case study database, and establishment of a chain of evidence (Yin, 2009). When a researcher is using multiple sources of evidence, the case is strengthened through data triangulation.

The second principle laid out by Yin (2009) is to create and maintain a case study database. Yin (2009) recommends that every case study should develop a formal, presentable data base so that other researchers can review the evidence directly (p. 119). A database increases and improves the reliability of this case study. There are four components for the development of the case study database: case study notes, case study documents, tabular materials, and narratives (Yin, 2009). For the use of case study notes, they were categorized and organized in a manner so that the researcher could refer to the notes easily after the study was completed. For the purpose of this study, the case study notes were organized in terms of teachers interviewed and in chronological order of when the interviews were given. Notes were

separated by school and grade level. All notes were transcribed into an electronic version. The online survey results were transformed into a series of data points and graphs that were used for applications such as PowerPoint or keynote. This information, like the other information the researcher gathered, was saved in an electronic file.

The third principle for data collection is referred to as "maintaining a chain of evidence" (Yin, 2009). This principle serves to increase the reliability of the information in this multiple case study. In this principle, an external observer can follow the derivation of any evidence and follow the steps in either direction (Yin, 2009, p. 122). The researcher provided a transparent method for the collection of data that will allow others to replicate the evidence and steps taken to collect the data. The data base disclosed the evidence collected and the circumstances it was collected under. This is consistent with the questions and procedures outlined in the multiple case study protocol. The content of the protocol is connected to the research questions laid out by the researcher (Yin, 2009).

The researcher, implementing the mixed method study, participated in the following steps to follow the process, as described by Yin (2009). These steps built upon each other in order to assist in answering the research questions that drove this study. The researcher completed the tasks to reveal elementary teachers' concerns with a new innovation and what barriers were present when integrating technology in the ITVLs.

The researcher obtained approval from the superintendent to survey staff. The school district that participated in the study, along with the four elementary schools within the district, granted the researcher permission for the study. A letter from the superintendent was written to communicate the approval (Appendix A).

Meeting building principals from the four elementary schools to review the study, clarify

any questions they had, and providing final details of the procedure and research steps to be followed was important when the researcher began the study. This occurred after permission was given from the university (Appendix B). The researcher did not make any pre- judgments or assumptions before, during, or after the study was being conducted. The study was not completed to evaluate but rather to inform.

Participants were recruited for this study through email invitations which described the purpose of the research and the procedures involved in participation (Appendix E). After the first email was sent, the researcher sent two more emails, one week apart, to reinforce the purpose and the procedures of the study to each elementary teacher participant.

Quantitative Methods

The researcher sent a web-based survey via staff email to all elementary teachers within the school district (Appendix C). Prior technology integration research has established that a questionnaire can measure the variables under examination (Mills, 2004; Newhouse, 2001). The researcher, conducting a mixed-methods study, utilized the CBAM as the quantitative form of inquiry. The CBAM is a well-known instrument and is cited in a number of research studies across the globe. Several studies have used similar methods to gain insights to barriers in the adoption of technologies such as the tools in the ITVLs (Westergaard, 2000; Pachnowski, 2002; de la Garza, 2006; Masalela, 2006; and Giuliani, 2001). This is supported by Hord (2001). In one interview, he stated, “The continuous use of the SoC questionnaire across nationalities and cultures seems to suggest that the concept and items hold-up (are validated) appropriately to this time” (as cited in Newhouse, 2001). The CBAM SoC questionnaire was used for the web- based survey.

The CBAM provided a research-supported framework for the purposes of evaluating the

concerns of teachers in the early stages of integrating the ITVLs into their lessons (Hall & Hord, 2001). The researcher used the SoC questionnaire but modified it from the original CBAM by replacing the word "innovation" with the words "Interactive Television Lab." The practice of modifying the CBAM questionnaire to fit individual research is evident in the literature (Hall & Hord, 2001). The questionnaire contained thirty-five items, each with a seven-point response rating scale. Use of the SoC questionnaire did not have to be validated because it is a standard instrument that has been used for many years by many researchers. Evaluating these concerns drew out both first- and second-order change barriers that were present between the elementary teachers and the use of the innovation. In particular, principles of change unique to the CBAM relevant to this study include the premise that the individuals within the school are the primary units of change, and teacher attitudes, beliefs, and values influence the change process.

The open-ended questions of the SoC Questionaire ask the innovation adopter (elementary teachers) to use complete sentences to describe or share any other concerns they may have at the present time (Hall & Hord, 2001). Where the Likert-scale items are used to create individual concerns profiles, responses to the open-ended questions contribute to the creation of a group concerns profile (Hall & Hord, 2001). Data from the open-ended questions are used to exemplify group concerns by painting a verbal picture of concerns. As recommended by Hall, the open-ended questions were adapted from the example provided by Hall and Hord (2001). The open-ended questions were these: (1) What other concerns, if any, do you have at this time, and (2) Briefly describe your job function.

Each elementary classroom teacher within the school district received an invitation email that included a link to the Survey Monkey website (Appendix E). Using the website allowed the participants to remain anonymous in order for them to respond openly and honestly. The

questionnaire needed to be completed in full and in one sitting. Each participant was allowed to submit one questionnaire. The researcher did not allow a questionnaire to be submitted without it being completed. This method was used because complete data was needed in order to be reliable. These methods guaranteed voluntary participants only since each participant had to open the link and complete the survey him/herself. The participants were free to stop participation at any time; however, once they submitted their questionnaires, the researcher could use their data since it was completed anonymously.

Qualitative Methods

After the collection of the CBAM survey data, the researcher conducted interviews with teachers from the four elementary buildings (Appendix D). The interviews were with two teachers from each school, eight total. The web-based survey gave the teachers an opportunity to volunteer for the interviews by including a disclaimer at the end of the survey with the researcher's email address. The participants were chosen from the list of teachers that noted on the web-based survey that they were interested in being interviewed. The researcher was purposeful when choosing which teachers to interview, creating a list of classroom teachers that noted using the technology and a list that noted that they did not use the technology within the ITVL.

Determining a person's stage of concern can be as simple as asking questions (Hall & Hord, 2001). When educators are interviewed under the CBAM framework, it is referred to as "one-legged interviews" (Hall & Hord 2001). The method of Hord's "one-legged interviews" is productive due to the nature of the informal questions. The researcher started the interviews with an open-ended question regarding the innovation, such as "how do you feel about" or "what are you doing with." This allowed the researcher to probe deeper in order to clarify or to draw out

examples (Hall & Hord, 2001). Interviewing the classroom teachers was an important aspect of the study because it was conducive for identifying critical information, for digging deeply into surface answers, for testing rival explanations, and for making the process more meaningful to participants (Holstein & Gubrium, 1995). One-legged interviewing strays from a strict question-and-answer format. The interviewer had the option of responding to participants' answers by offering comments, such as empathic statements or helpful information, as opposed to only responding with follow-up questions and probes. Participants then reacted to the interviewer's comments, making the process a conversation. The length of the interviews depended on the participants' answers, whether the interviews occurred toward the beginning or toward the end of data collection, and the participants' interest in talking with the researcher. Follow-up communication involved emails, phone calls, or a second meeting. All interviews were recorded on the researcher's tape recorder. All interviews were transcribed and coded, as explained in the data analysis section.

In order to gain a deeper insight into what barriers were present and how those barriers were connected to the concerns of the teachers, the researcher conducted a focus group interview session. Focus group interviews have been popular in the business and marketing arena to flesh out opinions and perceptions of employees and customers (Creswell, JW. & Plano-Clark, V., 2007). Over the years, this approach has become more popular in the educational field for many reasons. One reason is the overwhelming changes in education and the need to ascertain the perspectives of key stakeholders such as teachers, students, and parents. The focus group session consisted of the eight teachers that were interviewed, two from each of the four elementary buildings. After the individual interviews were conducted, the researcher asked each participant if he or she was willing to participate in the focus group session.

The researcher conducted the focus group interview after the CBAM instrument data was analyzed and individual interviews were completed. The focus group session, held in a local restaurant within the community the school district is placed, created an environment where the researcher expanded on common themes, connected cross-district concerns, and gained a better understanding of what barriers were present. The session allowed teachers to ask each other questions, compare experiences, and generate a deeper conversation.

Data Management

Quantitative Data Management

Individual data was entered into a spreadsheet program with participants listed in columns and survey questions in rows. Because each question linked to a specific stage of concern, an individual teacher's raw data was converted to stage of concern data, and total points from the Likert scale items were added. For example, questions 2, 13, 25, 26, and 29 all relate to stage 0: Awareness concerns, and questions 1, 9, 21, 22, and 31 all relate to Stage 6: Refocusing concerns. Rows on the spreadsheet represented the teachers' total score for each stage. For example, Teacher A may have a total raw score of five in Stage 0: Awareness, and a total raw score of 22 in Stage 5: Collaboration. The next step was to convert raw scores to percentages. A quick scoring table developed by Parker and Griffith (as cited in Hall, George, & Rutherford 1998) was used to convert raw scores to percentages, and that data was entered into the spreadsheet. Finally, using the charting feature of the Excel program, individual concerns profile graphs were created, using the stage of concern for the X-Axis and the percent of concern for the Y-Axis.

Qualitative Data Management

The researcher, recording the interviews using a tape recorder, transcribed each interview. The researcher engaged in line-by-line open coding, which involved breaking down data sentence by sentence, comparing them and placing them into categories (Glaser & Strauss, 1967). Taking the advice from Wolcott (2001), the researcher started with a few categories that facilitated the sorting of data and began looking for emerging themes. A data analysis document was created, listing each research question. When themes emerged during open coding, the researcher copied and pasted an excerpt from the transcript and placed it in an existing category or created a new category. When a new category was produced, the researcher included an excerpt that represented the category and labeled it with a phrase. As the data analysis document grew in length, the researcher was able to collapse categories and produce subcategories within each research question. After open coding, the researcher tested patterns by looking for negative evidence and attempted to account for differences (Miles & Huberman, 1994). Themes were revised or fortified by turning to data from participant observation and document analysis (Miles & Huberman, 1994). Field notes were primarily used to verify and challenge the analysis produced by the interviews.

Human Subjects and Ethics

The researcher submitted the proposal to the Eastern Michigan University Human Subject Review Committee for IRB approval. The researcher was attentive to human subjects and ethics issues in this study. The study did not begin until permission to conduct the research from the University was granted (Appendix B). The study involved adults who agreed to participate in the study. Fictionalized names were given to the school system, the four elementary schools participating, persons, and places to which references were made. The

interviewees were assured that their names would not be used in the research report. Patton (1990) stated interviewees' identities are kept confidential to protect them from harm or punitive action. "Because the basic researcher is interested in truth rather than action, it is easier to protect the identity of informants or study settings when doing scholarly research" (Patton, 1990, p. 213).

Analysis of Data

Analysis of empirical data for this mixed methods study was conducted in both a quantitative and qualitative approach.

Analysis and Interpretation of Quantitative Data

Quantitative data that were collected from the CBAM SoC survey were entered into a computer database and analyzed using SAS software. Descriptive statistics were calculated for the purpose of identifying the lowest to highest score, the median, the mean, and the standard deviation, regarding each teachers' stages of concern. Results were interpreted for use for the following purposes: (a) creating a district profile showing the frequency of the highest to lowest stages of concern, (b) creating individual teacher profiles reflecting the highest to lowest stages of concern. Data were analyzed following the guidelines and recommendations for evaluating concerns (Hall, George, & Rutherford, 1998; Hall & Hord, 2001). Research Question 1 asks, "What are the stages of concern of elementary teachers when implementing the new technology innovations within the ITVLs?" The findings from the CBAM survey, the quantitative instrument, helped answer this question and support the conclusions and recommendations of the researcher.

Analysis and Interpretation of Qualitative Data

Qualitative data were analyzed using a constructivist philosophy by embracing multiple

perspectives, voices, and interpretations in a contextualized way (Charmaz, 2002). The data analysis procedure included two steps: analyzing the quantitative, online survey and analyzing the interviews and focus group qualitative data.

The researcher used the interviews and focus group session to gain a deeper understanding of both the individual concerns and group concerns of the participants relating to the integration of the ITVLs. Follow-up was executed as necessary to capture additional data for clarification purposes. Once the data were reviewed, emerging themes and patterns were explored in order to extract meaning from the data. Narratives were constructed to capture variations in the data and present contextual understanding of the data.

Limitations

Limitations identify those factors that may produce potential weaknesses in the study. Limitations for this study will include:

a) Elementary teachers participated in the study on a voluntary basis only. The researcher did not require their participation, therefore limiting the number of participants;

b) The researcher worked under the assumption that the elementary teachers participating in the study gave accurate and truthful answers.

c) The data retrieved from the study covered the school years 2011-2012 when the technology was new to the schools.

d) There may have been other factors besides those within the study that affected the implementation of technology among the elementary teachers.

Delimitations of the Study

Delimitations are the boundaries and parameters set by the researcher and frames how the study was narrowed in scope. This study included the following delimitations:

a) The study looked at four elementary schools within one northern Genesee County school district;

b) The study was conducted in the spring of the 2011-2012 school year;

c) Participants were teachers of 1st through 6th grade students in the same district within northern Genesee County.

Validity and Reliability

Qualitative inquirers employ a variety of techniques to increase the trustworthiness of the research they conduct. It is important for participants to know that the researcher did everything possible to ensure that data was appropriately and ethically collected, analyzed, and reported (Cresswell, 2003). The researcher conducted member checking to gain feedback and trust from each participant. Member checking is an opportunity for participants to approve particular aspects of the interpretation of the data they provided (Doyle, 2007; Merriam, 1998). It is a "way of finding out whether the data analysis is congruent with the participants' experiences" (Curtin & Fossey, 2007, p.92). The researcher conducted member checking continuously throughout the interview process by providing participants with copies of the transcribed interviews via email and used the focus group interview session to clarify themes.

Summary

Chapter 3 provided the research tradition in which this study builds, along with an overview of the methodology used to conduct the study of the perceived concerns and barriers of elementary teachers integrating the technology within the Interactive Television Labs at four elementary schools within a northern Genesee County school district. Discussed were research design, including guiding questions, instrumentation, population and selecting participants. A copy of the instrument and associate permissions are included in the appendices. Chapter 4

presents the findings and Chapter 5 concludes with a summary, discussion and recommendations of the researcher.

CHAPTER IV – RESULTS AND ANALYSIS

Introduction

Technology tools continue to become more prevalent within public schools and are emerging as a necessity to prepare students for a global workforce (Collins, A. & Halverson, R., 2009). School districts are facing a challenge of integrating technology and moving to a more relevant environment when it comes to teaching and learning (November, 2010). Decisions are often made quickly, not allowing time for educators to research, collect data, and take the time needed to reflect on the barriers that are present in integrating technology. Many studies have been conducted in recent years, looking at both the effectiveness of technology integration and the change models that have been successful (Bebell et al., 2004; Hew et al., 2007; Cuban et al., 2001; & Hennessy et al., 2005). Additionally, both the literature and current practice suggest there are often barriers that impede successful technology implementation, whether extrinsic or intrinsic (Marzano, 2005).

The purpose of this study was to understand the stages of concern among elementary teachers in using new technology innovations and how perceived barriers may undermine the implementation of the technology located in the Interactive Television Labs (ITVL). The ITVL rooms include innovations such as an interactive whiteboard, student desktop computers, a teacher station with various technologies and a two-way interactive television to connect with anyone in the world with the same capabilities. The ITVLs were established in fall 2008 at all four of the elementary schools within the school district studied.

Participants

This study comprised approximately 100 elementary teachers in grades 1 through 6 across four elementary schools in one school district located in northern Genesee County. Each

school had approximately 450 to 500 students and the size of the classrooms ranged from 25 to 31 students in self-contained classrooms. The teachers had a variety of years' experience, age, college degrees, professional development training, and interests. The district technology plan calls for teachers to use email, Outlook calendar, and other technology tools such as PowerPoint. All teachers possessed a small amount of skill when using technology. Each school has a computer lab that all classrooms are assigned to use one hour per week. These labs are used for software- based individualized math and reading instruction.

Data Collection

Data collection began in October 2011 and ended in December 2011. Both quantitative and qualitative data were collected for this mix-methods study. The quantitative data were collected using the Concerns Based Adoption Model (CBAM) survey, with follow-up qualitative data being collected through interviews, and the focus group session. The researcher collected the quantitative data through an electronic survey using the CBAM Stages of Concern questionnaire (Appendix C); 39 of the 100 surveys sent out were returned. Teachers had the opportunity to volunteer for an interview and a focus group session. The researcher chose two teachers from each of the four buildings studied to be part of the interviews and focus group session.

Qualitative data from the interviews and focus group session were collected and then organized and coded from the interviews and focus group session. The CBAM questionnaire data has been subjected to a number of statistical analyses in order to explore, describe, and better interpret the findings of the perceived concerns of the end user (Hall & Hord 2001). Innovations bring change, and supporting people in change is critical for learning to sustain and make a deep impact in organizations (Hall & Hord, 2006). Change starts with the individuals in

the organization, and the level of change can be determined by how the teachers react to the innovations and how they perceive the change affecting their work. The Concerns-Based Adoption Model applies to anyone experiencing change, that is, policymakers, teachers, parents, and students (Hall, G.E. & Hord, S.M., 2011).

The Stages of Concern include the unrelated level, impact level, self-level, and task level of concerns (Hall & Hord, 2001). The unrelated level is the awareness stage (Stage 0) in which the individual has no concerns about the innovation. The impact level has three stages, consequence (Stage 4), collaboration (Stage 5), and refocusing (Stage 6), and shows the individual progressing from being less concerned about the innovation's impact on him/her as an individual and being more global in his/her concerns. Between these levels are the self and task levels. Individuals at the self-level are either at informational (Stage 1) or personal stage (Stage 2) of concern and have not necessarily fully adopted the innovation. Individuals at a task level are at the management stage (Stage 3) and may be asking themselves about ways to best organize their time to allow for innovation use (Hall & Hord, 2001). Additionally, the individual in a management stage may have concerns about taking full advantage of resources and materials that are associated with the innovation (Hall & Hord, 2001).

The CBAM model holds that people considering and experiencing change evolve in the kinds of questions they ask and in their use of whatever the change might be. Early questions are more self-oriented: What is it? How will it affect me? When these questions are resolved, questions emerge that are more task-oriented: How do I do it? How can I use these materials efficiently? How can I organize myself? Why is it taking so much time? Finally, when self- and task concerns are largely resolved, the individuals can focus on how the innovations will affect them, in this case the teachers and students. Teachers may ask, "Is this change working for my

students?" And eventually will ask, "Is there something that will work even better?"

Table 1. *Stages of Concern*

Stages of Concern	Expression of Concern
6. Refocusing	I have some ideas about something that would work even better.
5. Collaboration	How can I relate what I am doing with what others are doing?
4. Consequence	How is my use affecting learners? How can I refine it to have more impact?
3. Management	I seem to be spending all my time getting materials together.
2. Personal	How will using it affect me?
1. Informational	I would like to know more about it
0. Awareness	I am not concerned about it

The seven Stages of Concern (Table 1) provide additional description for how the Stages of Concern align with the Expression of Concern.

Results

Quantitative Results

The quantitative data were calculated for the purpose of identifying the lowest to highest score, the median, the mean, and the standard deviation, regarding each teacher's stages of concern. The descriptive results were interpreted for use for the following purposes: (a) creating a district profile showing the frequency of the highest to lowest stages of concern, (b) creating individual teacher profiles reflecting the highest to lowest stages of concern. Table 2 shows the lowest stage of concern, highest stage of concern, the median, the mean, and the standard deviation.

Table 2. *CBAM Survey - Stages of Concerns*

Stage of Concern	Stage	N	Min	Max	Median	Mean	Std. Deviation
Awareness	0	39	1.4	6.4	3.8	4.0	1.3
Informational	1	39	0.04	5	4.2	3.9	0.9
Personal	2	39	0.04	6.5	4.6	4.2	1.3
Management	3	39	1.8	5.4	3.6	3.4	1.1
Consequence	4	39	1.6	6.2	3.8	3.9	0.9
Collaboration	5	39	2.6	7	4.6	4.4	1.1
Refocusing	6	39	1.4	6	4	4.0	0.9

Individual Teacher Profiles of SoCQ. The CBAM Teachers' Concern Data was collected from Part A of the Stages of Concerns Questionnaire (Appendix C). The teachers were asked to rate their levels of concern in implementing the ITVL technology within their lessons. The questionnaire was administered to 100 teachers, with a response rate of 39% (n=39).

The data was analyzed using descriptive statistics, with the individual results of the teacher profiles showing a variety of high rates of concerns among teachers. Out of the thirty-nine teachers completing the survey, twelve scored higher at Stage 0 (Awareness) and eleven scored higher at Stage 5 (Collaboration). Individual results were lowest in Stage 1 (Informational) and Stage 6 (Refocusing). Within the frequency of the highest concern stage of the individual teachers, two teachers' highest concern was at Stage 1 (Informational), nine at Stage 2 (Personal), five at Stage 3 (Management), three at Stage 4 (Consequence) and two at Stage 6 (Refocusing). Table 3 shows the individual teachers' highest Stage of Concerns.

Table 3. *Frequency of the Highest Stage of Concerns of the teachers regarding ITVL technology*

Stage of Concern	0	1	2	3	4	5	6
			Self	Tasks			
Number of Teachers	12	2	9	5	3	11	2

Interpretation of the SoCQ Results. A Stages of Concern profile for individual teachers can represent the relative intensities of each concern toward an innovation in each of the seven Stages of Concern. The profile pattern, taking note of the highest peaks, characterizes the concerns of a nonuser, inexperienced user, experienced user, or a renewing user (Hall & Hord, 2006). The details of the concerns profile typically change as the end users, the teachers in this case, move through the change process, shifting from an emphasis on self-concerns to task concerns then to impact concerns. The individual profiles of the thirty-nine teachers completing the SoC questionnaire show higher scores in Stage 0 (Awareness) and Stage 5 (Collaboration). Twelve teachers were rated highest in Stage 0, while eleven teachers were rated highest in Stage 5. The high rating of Stage 0 could translate into teachers having little concern about or involvement with the ITVL technology. Five teachers, out of the thirty-nine teachers completing the survey, showed matching highest scores in two separate stages, which accounts for the 44 teachers listed in Table 3 and Figure 3.

Hall (2006) wrote that a high concern level at Stage 0 typically shows a different meaning for nonusers (teachers not using technology in the ITVL) than users (teachers that have used or continue to use the technology). The non-using teachers may be interested in matters concerning the innovation since it is new. The high score in Stage 0 reveals the nonuser teachers

were willing to know more about the ITVL technology. It is a positive finding for the group of teachers completing the survey. However, for teachers considered users of the ITVL, it may be deemed negative. A small group of users, five out of the eight, who were interviewed, have participated in the Pioneer training sessions delivered by the local intermediate school district. Since these teachers have been trained and have experience in using the technology within the ITVL, there is an assumption they will continue to implement the tools in their teaching. The high percentage score of Stage 0 in the user group could indicate that this group did not have much concern about using the ITVL innovation in the future.

During the interviews of these teachers and during the focus group session, it became clear these teachers' concerns seemed not to be tied to implementing the ITVL technology within their lessons; rather, they focused on other technology tools purchased for their own classrooms. Steve, a fifth grade teacher, talked about his frustration with having to share the interactive whiteboard and making sure it was available when he needed the innovation for his lesson.

> "We had no training, well official training, so I took it upon myself to play with it after school and during my prep time. When I saw an opportunity to ask for it to be placed in my classroom, I took it. To my surprise, they [administration] said yes!"

Steve had little interest in the ITVL, however, he was ready to take on changes within his own classroom if the technology was accessible to him on a daily basis. His high score of 0 did not reflect his excitement and his desire to use the technology; it rather reflects the frustration of the lack of resources and time in implementing new technology tools.

A high score in Stage 0 could point to teachers that are unaware of the capabilities of the ITVL and the need to have more information regarding the technology within the technology enhanced classroom. The high rating in Stage 0 for someone who was trained and uses the ITVL

technology reflects a different meaning than other teachers that do not feel comfortable using the ITVL technology that completed the survey. A user of technology and someone that is confident in the use of the innovation will often move away from the concern of implementation if resources such as technology support and accessibility are not addressed.

Stage 5 (Collaboration) involves teachers beginning to look at collaborating and learning from one another. They move through Stage 5 ready to begin coaching others in using the technology and begin to look at ways to be creative or alter its capabilities to fit their instructional needs (Hall & Hord, 2001). The high rating of Stage 5 points to teachers within the school district that are concerned about working with their colleagues to make the change effective and meaningful. A teacher in Stage 5 may ask, "How do I relate what I am doing with the innovation to what other teachers are doing." or "How can I see more cooperation among my colleagues as I work with this innovation." They know about the innovation and are interested in how it can help enhance lessons, but are worried about how others are using the innovation (Hall & Hord, 2006).

Nine teachers were identified as having a higher score for Stage 2 (Personal), the third highest stage among the thirty-nine teachers completing the survey. It is at this stage they begin thinking about their own interest in the innovation, how might it help them, how will it affect their teaching, and what impact will the change have on their careers (Hall & Hord, 2006).

Five teachers of the thirty-nine completing the survey scored higher at Stage 3 (Management). Stage 3 reflects a teacher that wants to focus on the processes and tasks of using the innovation and how to best use the technology within their lessons. Teachers at Stage 3 focus on knowing what to do with the technology in the ITVLs and are concerned about how to be the most efficient in using the innovation (Hall & Hord, 2006).

Three teachers out of the thirty-nine completing the CBAM survey scored highest in Stage 4. Hall and Hord (2001) state that the characteristics of teachers at Stage 4 are that teachers are concerned about time to learn the new innovation and knowledge to build it into the lessons they are planning. Routine competence and mechanical use concerns are prominent in this stage. In this stage, the teacher understands his or her responsibilities for using the ITVL technology and has a plan on how they will develop lessons accordingly. The teacher uses his or her knowledge and begins implementing the innovations to enhance teaching and learning. Gordon (2000) reveals Stage 4, consequence, as one that includes both the consciously and unconsciously skilled. Teachers at first focus on the task at hand, how to turn the technology on, use it correctly, and trouble shoot any issues. It takes the teachers' full attention to complete the task correctly. This is referred to as consciously skilled (Gordon, 2000). In Stage 4, when teachers' skill levels improve at completing the task, in this case managing and implementing the technology in the ITVL, they are unconsciously skilled as they become comfortable with the new innovations.

The low number of teachers scoring high in Stage 1 (Informational) and Stage 6 (Refocusing) reflect the findings of the highest stages. Teachers unaware of the innovation or purpose of the innovation do not need, or are not asking for, more information (Stage 1). Teachers in Stage 5, looking to collaborate and learn more with their colleagues, are not yet ready to take the next step and redesign how the innovation is used within the classroom.

Only two of the thirty-nine teachers scored highest in Stage 6, the refocusing stage. Teachers prominent in Stage 6 show they had other ideas about implementing technology within their classrooms (Hall & Hord, 2006). They expect to have major changes or replacements with technology alternatives within their classrooms rather than relying on the technology within the

ITVLs. Overall, teachers did not feel confident in integrating ITVL technology within lessons. They were uncertain what to do and how to do it.

If a teacher scored high in multiple stages, it does not necessarily contradict one stage over another. It is possible that once teachers feel unconfident, uncertain, or insecure with change, they expect to explore other new ways to replace the existing form. Change is a continuous process (Hall and Hord, 2006). Once teachers become comfortable with the innovation and move through the Stages of Concerns, a new innovation may have to be introduced, and they may move back to Stage 0, awareness. Figure 1 shows the teachers' highest stage of concern.

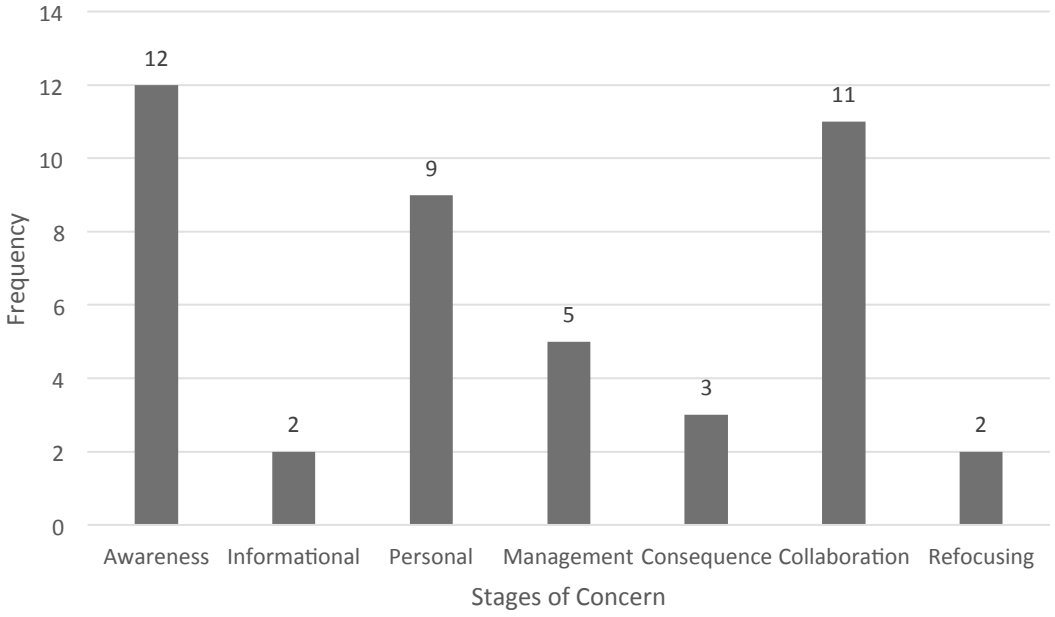

Figure 3. Frequency of Highest Stage of Concern. This figure illustrates the highest stage of concern of the teachers, based on the survey results.

Qualitative Results

Profiles of Teachers Interviewed. Eight teachers were interviewed for this case study, two teachers from each of the four elementary buildings located within the school district. The

teachers volunteered for the interview and met with the researcher for a focus group interview session after all individual interviews were conducted. Of the four elementary buildings included in the research, two had more than two teachers volunteer. The researcher chose the volunteers from those buildings based on their availability to interview during the time he scheduled.

The eight teachers' profiles of the SoCQ were used to connect the profile with the interview answers to draw out what concerns each teacher had with the innovation of the ITVL labs. The researcher has used pseudonyms to keep the identity of the teachers confidential.

Teacher 1. Sue is in her eleventh year of teaching at the elementary level. She holds a master's degree and teaches 5th grade. She participated in the Pioneer Program and was excited to have the first Interactive Television Lab in her school. Her highest rated Stage of Concern was Stage 5, collaboration. She is considered a technology coach and has served as the go-to teacher when it comes to technology issues in her building and within the district. Sue took on a leadership role early in the roll out of the ITVLs, including Read across America activities when children would connect with other classrooms from across the country. She expressed being frustrated that she did not have control over the innovations in the labs such as with other technology tools in her classroom. In her classroom, she has a device that turns any whiteboard into an interactive board, an ipad, and two student desktops.

Teacher 2. Steve, a male, teaches 5th grade at the elementary level and has been teaching for seven years. Steve taught in both an urban district and rural district before coming to the district in this study. He has a master's degree in administration and is currently in a program to gain more credits toward the necessary thirty credits needed on the teacher pay scale. Steve did attend a year of Pioneer training at the ISD and has an interactive whiteboard in his classroom.

His highest rate of concern was at Stage 4, consequence. His main barrier to full implementation is time to train and play around with the technology present in the ITVL.

Teacher 3. Betsy is a twenty-year veteran, teaching 4th grade for all twenty years. She is currently attending graduate school to receive her degree in administration. She was a Pioneer and a leader in utilizing the innovations in the ITVL during the first two years of implementation. Betsy is a technology user at home where she uses various devices such as a MacBook and a Dell desktop. Betsy's highest rated Stage of Concern was Stage 4, consequence. She became frustrated with the training that was available due to the lack of resources at the building level to practice what she was trained on in the ITVL.

*Teacher 4***.** Marnie is a 6th grade teacher and has been teaching for twelve years. Her highest rated Stage of Concern is Stage 3, management. She holds a master's in curriculum and is an aspiring principal. She is excited about new technologies and was happy to see a technology rich environment created through the ITVL innovations. Marnie mentioned the ability to take risks as the key factor in overcoming obstacles to ITVL innovations being used on a consistent basis.

Teacher 5. Kristie has been teaching for six years and is currently working toward her master's degree in reading. She taught 2nd grade for four years and was teaching 4th grade at the time of the interview. She didn't know about the ITVL until her second year of teaching. Kristie explained that no one was using the room to her knowledge and the principal did not include the ITVL innovations in any of the staff trainings. She was a Pioneer but felt as if there was no time to come back and train the staff on what she had learned at the trainings. Her highest rated Stage of Concern was Stage 4, consequence.

Teacher 6. Tony is a first- year teacher and currently teaches first grade. His highest

rated Stage of Concern was Stage 0, awareness. He student taught at the Early Childhood Center within the district in the previous year. Tony did not receive much technology training in his pre-service classes but did take one technology class in his senior year. He had never heard of the ITVL or of the innovations within the room until mid-year. His classroom consists of three student computers that he utilizes for online learning in math and reading for his students.

Teacher 7. Patricia, a female, teaches fourth grade and has been teaching for twenty-seven years. She holds a master's degree in teaching. She participated in the Pioneer program but stated she attended only half of the training sessions. Her highest rated Stage of Concern was at Stage 0, awareness.

Teacher 8. Kurt teaches third grade and has taught third grade for his entire fifteen-year career. He holds a master's degree in elementary teaching. Kurt participated in the Pioneer program and has tried various innovations in his classroom and in the ITVL. He likes to think of himself as a teacher willing to take risks if it means his students will succeed. His highest rated Stage of Concern was 0, awareness.

Table 4. *Teachers Results*

Name	Years of Teaching	Degree	Gender	Participated in the Pioneer Program	Highest rated Stage of Concern
Sue	11	Master's	Female	Yes	Stage 5 (Collaboration)
Steve	7	Master's	Male	Yes	Stage 4 (Consequence)
Betsy	22	Master's	Female	Yes	Stage 4 (Consequence)
Marnie	12	Master's	Female	No	Stage 3 (Management)
Kristie	6	Bachelor's	Female	No	Stage 4 (Consequence)
Tony	1	Bachelor's	Male	No	Stage 0 (Awareness)
Patricia	27	Master's	Female	Yes	Stage 0 (Awareness)
Kurt	15	Master's	Male	Yes	Stage 0 (Awareness)

N = 8

Teacher Interviews. Interviewing eight teachers from the school district, two teachers from each of the four elementary buildings, gave the researcher an in-depth understanding of the concerns the teachers had in using the innovations within the ITVL and what perceived barriers stood in their way. A common theme that arose was the fact that the teachers did not receive adequate information about the ITVLs during the rollout of the new innovation. Teachers were interested in knowing general information about the ITVL technology, what the innovation was, and what learning to use the room would involve. Tony was disappointed with the lack of information given to him as a new teacher: "I didn't know about the ITVL until I walked by the room in December and saw another teacher using it to connect with a class from another district. I wish I would have known about it in the fall." As this teacher's response demonstrates, the rate at which teachers use technology diminishes when they are not well informed about the possibilities of how the technology may be used and what these possibilities will add to the classroom experience.

The teachers were concerned about the lack of knowledge about their part in implementing the ITVL technology within their lessons and expected to receive more information from both the school district and the intermediate school district, which was responsible for the installation of the ITVLs within the buildings. Steve, who participated in the Pioneer training, explained his frustration as "feeling like he was hitting a brick wall" when he came back to the building to share. Steve described how everything he learned at the ISD was almost impossible to bring back and model to teachers.

> My training or professional development at the ISD was worth attending, and I was actually excited to go when we had a session. The ISD would lift the firewall so we

> could visit a website or use a certain program to create a lesson. When I returned back to the district, the firewall was back up. Getting permission to use the websites was very time consuming, and I didn't want to take the time. I was discouraged to hear 'no,' or 'we will try', but the ISD has to lift that… (Steve, 2011)

Consistency in the accessibility of resources and websites across the county would prove to be helpful in integrating technology (Jacobs, 2010).

Teacher Responses and Major Themes

The teachers' concerns about implementing the new innovation of the ITVL technology were collected by completing the SoCQ survey, along with conducting one-legged interviews. The interviews, lasting approximately thirty minutes, were recorded and transcribed. Coding was used to identify common themes and the perceived barriers to implementing the innovation. The eight teachers identified for the interview volunteered by completing a consent form at the end of the SoCQ survey.

Major Themes

After a review of the data, various patterns and themes emerged. The interviews revealed four perceived barriers for teachers in implementing the technology in the ITVL, these included: the lack of teacher training in and technical support for the technology available; the lack of administrator priorities and support; the lack of resource allocation and convenience; and the inability to reduce the workload.

The Lack of Teacher Training and Technical Support. The school district in this study worked with the intermediate school district to bring an ITVL to each of its four elementary buildings in fall 2008. The desired outcome was to create a technology-rich environment for each teacher to utilize during the instructional day. The Intermediate School

District within the county (ISD) was awarded a grant to place the ITVLs in each of the eighty-eight elementary buildings within Genesee County. The school district studied was one of the first districts within the county to receive the ITVL. Early in the 2009-2010 school year, the ISD began training a small group of teachers from local school districts on how to use the ITVLs. The teachers involved in the training were called Pioneer teachers, and the training included a teacher from each of the four elementary schools within the school district studied by the researcher. The Pioneer training continued for subsequent years with different teachers being trained each year. The goal was to train a small group of teachers each year that would return to the buildings and train other teachers in using the ITVL technology. One teacher interviewed, Marnie, a 6th grade teacher rating high in Stage 3 (management) that has been teaching for twelve years, described the training as intense, deliberate training that she never had participated in previously. She stated,

> ...while at the training, I would be motivated to come back and try the instructional practices we discussed. I was introduced to new websites, new tools such as interactive whiteboards, and really in a way, shown a new way of teaching. I feel it fell short because there was no time to share these ideas with other staff members; I found myself as an outlier using the new ITVL room. In an elementary school, it is difficult to use prep time to collaborate on projects or to try new things. We have no time to play with the technology. We need support and training.

Professional development is most effective when it is consistent, sustained over time, and embedded within the daily routine of a classroom teacher (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009). Marnie expressed this within the focus group session, and the other teachers agreed. Patricia supported Marnie's claim that the sessions were not sustainable

over time due to the lack of support at the building level. Patricia stated,

> …part of the Pioneer experience was a project we had to complete through a collaborative effort with others from other districts. During the day we were at the ISD, it was great. We worked together and we had the technology to make our project a success. I found that when we returned back to the building, it fell short due to the lack of time and due to the lack of training that I had to learn how to utilize the ITVL the right way.

Marnie's and Patricia's concern of time management reflects Stage 3 and the conscious efforts of the teachers to collaborate. This shows they are ready to move through Stage 4 (Consequence) and into Stage 5 (Collaboration). Their perceived barriers of time and support are hindering their transition to sustainable change (Marzano, 2003).

The other six teachers interviewed had similar experiences, noting that staff meetings often were not used for ITVL training or discussion. The teachers interviewed, whether a Pioneer teacher or not, felt there was a disconnect between the days spent at the ISD and their everyday routines at the building. Kristie, a 4th grade teacher rating highest at Stage 4 (Consequence), talked about the lack of support at the district level when it came to trouble shooting.

> Finding help or support wasn't easy. We would often have to call one person at the ISD to help. Imagine calling one person that is responsible for the whole county. We were lucky to get him on the phone. Many times if we had minor issues, district technology personnel would still have to call the ISD to help troubleshoot. As teachers, we would talk about how it was easier to just stay away from the ITVL. We would plan lessons [and] then have to wait a long time if the technology wasn't working. The problem is we

> would walk our class down [and] then have to walk them right back to the classroom. Much time was lost.

Kristie, like many teachers in Stage 4, was looking at the impact her time and energy spent on ITVL technology would have on her and her students. What are the consequences of taking these risks and trying new innovations in place of the status quo? Steve, who participated in a year of Pioneer training, mentioned that over time, having a building teacher that learned how to take care of the minor issues helped him create successful lessons in the ITVL. "Having a teacher or two in the building that is excited about the technology and knows how to implement it is helpful. There was a time I planned on connecting to a room, and the mute button wasn't working. I called the teacher in, and she took care of the issue in five minutes. If I would have called the ISD, it would have been a long time." Steve's comments point to the importance of real time problem solving. Having experts in the building would have been helpful for trouble shooting in the ITVL. Steve went on to say,

> …I did notice that once a few teachers learned the technology, used it successfully, and coached others, we had a few really cool things going on in the ITVL. Teachers would ask to take a few minutes at a staff meeting or would talk during lunch and focus on the ITVL technology. Teachers were getting excited. They started to envision themselves using the ITVLs and how it could impact their lessons and instruction. They wanted to use it and learn how to integrate the technology. The excitement went away after a while. Reading interventions and RTI was [sic] the focus at meetings, and teachers were stressed over too much on their plate. The teachers that were technology savvy said they didn't have time to help, and I could tell they were discouraged.

A common theme among the eight teachers interviewed was the time spent on talking

about the technology versus time spent practicing the use of the technology. The teachers felt they had no say in the training sessions given by both the ISD and district personnel. "I was confused at times or at least not very concerned about the ITVL only because I wasn't a part of any planning or lesson design. The excitement I had at first was clouded by the majority of time that was spent on telling us about the technology or showing us how to use it rather than allowing me time to try new things with the technology," explained Sue. "We meet as a staff every other week. If staff meeting time or our team meeting time could have been used for us to model these skills or applications, I could find ways to integrate the technology into my lessons." Giving teachers time to play with the ITVL technology, along with the proper training, is crucial in getting the buy-in that is needed. Second-order change must involve intrinsic motivation, not a top to bottom approach (Marzano, 2003).

The CBAM survey results from the thirty-nine teachers completing the survey showed teachers were concerned about what the ITVL is and how to use the technology and how they could work together and learn to use the innovation. This matches the highest scores in both the awareness stage and collaboartion stage. The perceived expectation by the teachers interviewed was that the ISD and the district studied would encourage or require that all teachers use the ITVL to teach a variety of technology-enhanced lessons. Out of the eight teachers interviewed, only one talked about having a technology rich class or classes in their pre-service training at college. Teachers, by trade, are not technology experts. In today's culture, teachers using technology should be well versed in informational technology and know-how to embed the tools within their daily lessons (November, 2010). In order to do this effectively, the teachers interviewed were looking for training on how to use the interactive television and interactive whiteboard within the ITVL. Betsy expressed the need to gain knowledge on how to use the

student computers effectively within lessons and how she might utilize the technology that was available, such as document cameras, to engage students. Betsy added,

> I want to use the technology in the ITVL. I see others use it from time to time and know I can be creative. If I do not have the basic knowledge in using these innovations, it is expected I will encounter difficulties while trying to implement the tools within my lessons. I have been teaching for twenty years. It has been a long time since I have been in a classroom myself learning and I, of course, had no clue about technology like this in college. Technology has changed so quickly I can't keep up. I know it's important; I see others using it in creative ways, but have no idea where to start."

Explained Tony,

> I am frustrated. I am a new teacher and want to use the technology within the ITVL, but did not have formal training or time to train myself. I think people assume I am tech savvy because I am a new teacher. I had one course in my college years that taught us Microsoft products, like PowerPoint. The new technology now and the programs on the Internet, I have had no training. I take time to learn it, but it is just not a priority for new teachers, so I focus on other things.

Added Patricia, twenty-seven year veteran,

> I have many ideas of how to use the technology but lack the knowledge of how it works. I talk with my friends and fellow teachers all the time about ideas and how I have to take my kids down there and do something more engaging with technology. If I had proper training, I see the importance of using the innovative technology and would implement [it] on a weekly basis.

Most teachers interviewed did not have training outside of the pioneer training at the ISD. All

eight teachers revealed their district training has been in best practices wrapped around literacy and reading intervention, not technology. Both the teachers trained through the Pioneer training and the teachers not trained reported they were not tech savvy or machine oriented. Perceived barriers in their minds were time to be trained and not having adequate technical support outside of the ISD.

Training is crucial to using technology (Darling-Hammond, L., Wei, R. C., Andree, A., Richardson, N., & Orphanos, S. 2009; November, 2010), and support is needed as teachers take risks and learn to use innovations. The ISD employs a staff that is focused on and trained in the ITVL technology. All eight teachers interviewed stated that the support is effective when the staff is available. Since many schools across the county have the ITVLs, so few staff members cannot keep up with the number of help tickets created on a daily basis. Teachers reported lessons in which they planned and practiced using the ITVL technology, only to have it wasted due to technical difficulties. The ISD staff was not available, and the school district staff did not have access or control over the technology to fix the issues. Kurt, a third grade teacher with fifteen years of experience, stated, "Imagine preparing a writing lesson with no paper or pencils for your students. That is what we are afraid of. Class sizes are big, kids need to be engaged, and if we plan lessons only to see the technology not work or something go wrong during the lesson, we are in trouble." Teachers become frustrated as they reach outside of their comfort level to only meet barriers such as the lack of technical support to keep them from achieving the outcomes. Embarrassment, loss of confidence, and reminders that they are not skilled usually lead to teachers not taking risks or time to reflect on the usage of a new innovation (November, 2010). Technical assistance could offset this problem and help teachers solve external barriers to advocate technology usage. Sue, a 5th grade teacher with eleven years of experience, pointed

out,

> Technical support may not involve the teaching and learning side of the lesson but makes using the innovation more efficient and creates a safe environment for me and my colleagues to try new things. Teaching, like many other jobs, must involve deciphering what is most important and what can be let go. If technology is becoming a priority, teachers often will ask, "What can I take off of my plate?" I know I have been asking that and trying to figure out how I will balance new technology and new expectations from the state and the district.

The Lack of Administrator Priorities and Support. The National Center for Education Statistics (2010) indicates that principal leadership is one of the most important factors affecting the extent of how teachers use technology in their classrooms. Principals who exhibit instructional technology leadership are instrumental in modeling the use of technology within the school and ultimately in classrooms. They understand how technology can support best practices in instruction and assessment and provide teachers with support and guidance. In a study of three schools identified as successful integrators of technology, Wilburg (1991) found in all three cases, the administrator was a strong advocate for and strong proponent of technology (as cited in McElfish, 2006).

As early as 1995, the Office of Technology Assessment found that principals who are knowledgeable about technology and technological issues are important advocates for the integration of technology into schools. Dede, Honan, & Peters (2005) found administrative support was crucial in determining whether or not teachers would integrate technology. By making technology integration a priority, building principals can reduce barriers such as insufficient time for training and continued learning, limited access to technology, and the lack

of technical support. Dede, Honan, & Peters (2005) observed that administrators offered their teachers needed emotional and moral support by showing interest in changes teachers were instituting in their classrooms. Working with the staff to create a shared vision for the future, the effective building administrators eased tensions among teachers and fostered teacher collaboration rather than competition. The eight teachers interviewed in this study reflected on their experiences at the building level and pointed to working for administrators who needed training. Staff meetings or professional development time did not include technology "…because our principal did not know how to use it and was scared to take the risk himself" (Betsy). The different approaches a principal uses can influence a teacher and the behavior of the whole staff (Liu, Ritzhaupt, & Cavanaugh, 2013).

As Hall and Hord (2006) point out, supporting teachers is important in successfully moving through the stages of concern. However, it is especially important during this time in education where we see more and more emphasis being placed on teacher evaluations. Teacher evaluation is at an all- time high when it comes to high stakes for both teachers and principals. Teachers expressed their desire to please the principal, especially since they are their evaluators. The building administrator's priority always will transfer to the teachers when the evaluation process looks at school improvement efforts and student growth. Marnie worked for a former principal that placed technology on the forefront and compared her experiences working for him and working with the present principal who does not put technology first.

> As a staff and as me as an individual, making the principal happy or respect you is important. I have worked for a variety of principals and find that we tend to focus on what the principal focuses on. Most teachers want to show they are doing what is needed or wanted. With the old principal, he would have a schedule hanging on his door to use

> the ITVL and would remind us if we have not signed up for a while. He was always pushing technology integration. He would talk about the ITVL at staff meetings, bring others in to train us, and made sure we knew it was important. Our new principal has turned it into a storage area and Response to Intervention room where paraprofessionals work with small groups. I am not expected to use the ITVL, so I focus on other things I am expected to do. While Marnie knew technology integration was important, her focus remained on practices that were important to her principal and would be evaluated.

Leaders influence individuals and organizations while supporting learning that leads to individual and organizational goals. At the organizational level, leaders develop a shared vision and broad goals. Leaders accept responsibility for achieving results and create the necessary environments that contribute to individual and organizational success (Waters, Marzano, & McNulty, 2003). Marnie shared her experiences with a building principal that allocated funds for the use of the ITVL.

> My principal created a separate budget for the ITVL. We were spending $40-$60 per virtual field trip. The principal would talk to the PTO [Parent Teacher Organization] and make sure they set funds aside to pay for ITVL activities. Other schools were not doing this. It was important for us to feel we had support from parents and administration in trying out these innovations.

Kurt, a 3rd grade teacher teaching in his fifteenth year, agreed and added,

> Working at a school where the principal didn't advocate for us to use the ITVL, it was never on my priority list with everything else I had to do. I find myself choosing between creating a new lesson or delivery method inside the ITVL and making sure my data sheets for DRA are ready for the monthly data meetings. I have worked for three

> principals, and all three did not set technology as a priority. I am not saying they didn't think it was important-- they did, but I knew that if my focus was technology and not raising test scores, I was in trouble. The support, in my opinion, was not there because the principals themselves were not comfortable with the new technology; they were lost, too.

Patricia added,

> Everyone knows technology is important, but no one knew how to use it. The ITVL looks like an amazing classroom with amazing technology, but no one really knows what to do with it in my school. I know other schools that have principals that are tech savvy or encourage teachers to try new things with the technology. There is one school that does not have a tech savvy principal, but he makes sure that if anyone wants to learn how to use the technology, he will cover their class. That's support.

Comments like this show a need for a better communication tactic to ensure teacher awareness with what tools were available and how to use the technology.

Betsy, a teacher at the school where the principal made the ITVL a priority, described how it was a successful rollout.

> Technology started to become a first priority. Articles were shared, we had a book study, and parents actually were asking if we were using the ITVL. The principal would tell us that everything we do should be at least tried with the new technology. The principal held every staff meeting in the ITVL and used the technology. He had a sign- up sheet on his door, he sent emails as reminders, and [he] made sure we shared our success and failures within the ITVL. He made it feel safe to take risks and, in fact, encouraged us to try new, innovative ways to teach.

Administrators play a huge role in technology integration (November 2010). Teachers that are on the fence and not sure what to make of the innovations will take more risks if the principal is modeling the use of the technology and is positive about the change.

The Lack of Resource Accessibility and Convenience. With the installation of the ITVLs within the school district, technology- rich environments were created in each of the four elementary schools. The study showed that the eight teachers interviewed were all concerned about the allocation of the room and its technology. They all expected to have full access of the room when needed and wanted it to be as convenient as possible. According to the eight teachers interviewed in the focus group session, placing expectations on teachers to use new innovations without having them accessible to the teachers when needed was irresponsible. Kristie, who did receive Pioneer training, talked about how teachers were concerned with the amount of time it took to plan for a lesson within the ITVL and the energy it took to tweak her lessons to build in the innovations.

> I would work all night on these ideas and work with others on my prep time or after school to build in new technology. However, when the room was not available due to other teachers using it or other programs occupying the space, I became discouraged and decided not to use the ITVL. It became a sore subject for a while as me and a few others wanted to use the room for the technology within it and try new things with our students. Connecting with others and collaborating on projects is important to me, and I know it's needed. I do not have any technology in my own classroom to allow for this. Skype is blocked, and the district will not buy me a camera for my desktop anyways. The ITVL quickly became a room that was used for other things rather than technology integration.

The teachers expressed their desire for this barrier to be removed by making the innovation

available and convenient to use. Marnie noted,

> This can be said with traditional manipulatives or teaching supplies as well. If they are not easily accessible during the day, teachers will often not use them. Convenience is crucial when working with kids. I need to adjust my lessons, and if I turn to grab something and it's not there, I go on to something else. I need to keep the kids engaged.

The teachers reported being pulled in many directions and having limited time during the day. Technology must be accessible and convenient (Shaw, 2011). Out of the eight teachers interviewed, five were former Pioneer teachers that received training from the ISD. The Pioneer teachers, being trained and introduced to a variety of ideas and examples of how to implement the technology in the ITVLs, reported wanting to have more technology within the classroom and at their fingertips. Accessibility and convenience were external barriers each of the five teachers struggled with. Knowing the importance of technology integration, they felt the inconvenience of the ITVL, and accessibility stopped them from using it effectively or using it at all. Tony added to the discussion by pointing out, "This is a barrier that may be easier removed than the others. As technology continues to change, school districts should be looking for ways to place the learning tools in the classroom rather than have one separate room [where] teachers must travel back and forth." An example of how Steve overcame the barrier of accessibility is how he used Skype. The ITVL provides distance learning capabilities, but he could not get in the room for a long period of time due to reading intervention groups.

> I downloaded Skype and used it to connect with other classes from around the state of Michigan. I bought my own camera and begged my principal. I am tired of jumping through hoops to use the tools and programs our students deserve to use. I had to go through our technology department and sign a waiver, but once I had access, I realized

> there was no reason to travel to the ITVL. It [Skype] was not a great picture, and the screen was smaller, but it did the job.

Marnie stated, "Accessibility is key when the school day is limited and there are so many things we must do. The sense of urgency is there when it comes to the teachers knowing technology is important." The teachers perceived the barrier of convenience as a result of budget and technology management issues. The ITVLs were paid for by a grant and did not cost the district any money. Steve summarized what many said during the focus group sessions: "As technology becomes less expensive and our students themselves have devices, I see us moving in a direction where each teacher has technology in their classroom and not housed in one separate place for them to share."

The Inability to Reduce Teacher Workload. All eight teachers interviewed were concerned about the increasing workload as the nation experiences shifts in both content standards and instructional practices. The possibility of the common core state standards and smarter balanced assessment expectations coming in 2014-2015 has placed an enormous amount of pressure on both administrators and classroom teachers to improve student growth (Kendall, 2011). The new common core standards, along with the new National Education Technology Standards (NETS), have started making classroom teachers prioritize more than ever to decide how to focus their time and energy. Implementing the ITVLs into lessons takes a shift in time, preparation, skill level, and mindset. New innovation implementation equals new roles and new approaches for educating students. The barrier of time and energy creates problems for teachers by increasing more time in planning, preparing, and searching for resources to make the lessons successful (Dede, Honan, & Peters (2005). When asked what they would suggest to teachers thinking about using the innovation, the teachers that were trained at the ISD reported teachers

should plan on spending the bulk of the time during individual prep hours and time at home adjusting to the new innovation and learning how to build it into the lesson. Steve added,

> The training at the ISD sparked an interest in using the ITVLs, but I was left to use my own time after school or before school to train myself and familiarize myself with the technology. Staff meetings did not offer time, I felt unsupported with my creative ideas to use the ITVL, and the pressure we have on us as teachers is crazy right now. Read the papers; education is getting beat up. As a teacher, I need to balance things and not get burned out. I feel technology if used right can help us, but I need to see how it will free up some time and pressure. ”

The three teachers interviewed that did not receive Pioneer training at the ISD did not attempt to add the innovation into their workload at all. All eight teachers interviewed reported the increase in their workload over the course of the last five to ten years, depending on their tenure in the district, as affecting their use of the technology. Tony, a first year teacher, is already feeling the pressure of a full plate. He reports.

> Initiatives such as Response to Intervention [RtI], professional learning communities [PLC] focused on data, and new state standards often get in the way of my creative side and pull me away from trying something new. As a first year teacher, I have had an opportunity to get trained in many areas here and at the ISD. I have a mentor, and other teachers are great in helping me fit in. ITVL has never come up as a priority, though. I am a year in my first job and ready to call it quits sometimes.

Kristie explained,

> I have a choice every day: be creative or get through the curriculum. Pressure is coming down more than ever in my career, and student achievement scores are the priority. I

often look at technology or the projects as a bonus or extra activity. I know this is wrong, but I simply am not sure how to build it in correctly and effectively.

The key for school districts implementing technology is to find ways to incorporate the innovations into what is already expected and not make it a separate initiative. Chris Lehman, principal of The Science Leadership Academy in Philadelphia, PA, (2012) explains, "…technology should be like oxygen, ubiquitous, necessary, and invisible. In the end, it's not about the technology, it's about the people using it and how they use it (McLeod & Lehman, 2012).

The implementation of a new innovation often will involve a large, non-teaching workload. Training, researching, practicing, and other processes are needed to make a shift from one approach to another. Teachers' workloads become increasingly bigger as they shift to more technology based instruction, at least in the beginning. Teachers need to be confident and efficient in their teaching as they start their careers before moving into another approach or implementing a new innovation. Steve described a time when he felt better about trying the ITVL. "My principal had us make a list of things we could throw out or replace by using the ITVL. It worked for a while but the focus on making things simpler to try new ways of teaching seemed to just disappear after a few months. I went back to the same old thing." The heavier workload resulted in a barrier for teachers to effectively use the ITVLs across the four schools.

SoCQ and Teacher Interviews

The personal profiles of the eight teachers interviewed are shown in Table 3. The highest concerns of the teachers interviewed were Stage 0 and Stage 4. The high intensity in these stages points to a need for awareness and an introduction to what the ITVLs are and how they will positively affect teaching and learning (Hall & Hord, 2006). The high intensity in Stage 0

(Awareness) reflects the fact that the teachers, both pioneer and non-pioneer, were concerned about learning what the new technology in the ITVLs was and how might they integrate the innovations. The teachers were also concerned about how the innovation would affect their day and the students' learning. They talked about workload, expectations from the administration, and what effect the technology would have on their teaching. The high intensity of Stage 4 (Consequence) reflected these concerns. Essentially, the question that is asked in Stage 4 is "What are the consequences for me and my students in making this transition?"

The ITVL was a county initiative brought to the school district. Some of the eight teachers' concerns showed minimal confidence in the use of the ITVLs for teaching, which is reflected in three of the eight teachers scoring high in Stage 0 (Awareness) of the Concerns Based Adoption Model. The teachers completing the Pioneer training from the ISD, having a solid knowledge of the ITVL technology, also showed a lack of confidence in making systemic changes to their lessons due to the lack of support and resources. This is reflected in three of the five teachers having Pioneer training scoring high in Stage 4. While they were trained and may be able to use the innovation, they are concerned about how integrating technology within the ITVL will affect their students.

Most of the teachers did not know what to do when they found they lacked the technical skills to manage the innovation. Teachers were concerned about how to control the computers, how to implement the technology into the curriculum, and how to prepare for failures. These concerns matched the teachers' discussions on the lack of training on how to use the ITVL technology and reflect Stage 3 (Management). The majority of the teachers interviewed expressed the need for more training and time for self-training and hoped to have technical support in a timely fashion. Teachers reported the need for technical support inside each school

and not having to rely on the ISD for help during the lesson. The eight teachers reported a sense of urgency to stay abreast of technology usage, innovative teaching and learning, and the need of training in how and why to use the ITVLs.

There is a possible contradiction as the eight teachers reported being concerned about time management and workloads while also being concerned about receiving more training and more information about the ITVL technology. This could be explained by noting the teachers were not excited or aware of the idea of having the ITVL in their building in the first place. The teachers may feel they were not part of the decision to bring the ITVL to the district and had no choice but to use the technology. Teachers feeling this way expect proper training and technical support to solve both short- term and long- term issues to implement the technology in the most efficient and meaningful way (McLeod & Lehman, 2012).

In addition, teachers reported their belief that technology is of the utmost importance in education today and gave examples of how they altered the technology in the ITVL to fit their needs. Reporting this and reflecting on their personal profile of the SoCQ, the researcher found it is possible the ITVL technology is not challenging to them and they have found ways to modify the innovation to get around the external barriers. The teachers with a high 6, high 3, but a low 0 and 1 may reveal a positive attitude towards the innovation. Though excitement is there, time management and concerns about accessibility and convenience deter ultimate usage. This teacher, like the two noted, is anxious to improve the innovation. An example given was Steve took the interactive whiteboard that no one used within the ITVL and moved it to his classroom. This solved the issue of the external barrier of convenience and accessibility.

Teachers scoring high in Stage 6 and high in Stages 0, 1, and 3 may not be so positive toward the innovation. These teachers reported using the innovation only when administration

told them they had to use it. High intensity at Stage 1 points to wanting to have information on the ITVL, but high intensity at Stage 3 shows a concern with managing time and technical issues. Teachers want information on how it will be manageable, meaningful, and purposeful for them and their students. Once they are convinced the innovations are worth implementing, they will work through the barriers of time and technical support.

Summary

Chapter 4 summarized the data by presenting the CBAM questionnaire results, along with the results from the participant interviews and focus group session conducted for this study. The chapter identified four common barriers to technology integration among the eight teachers interviewed, teacher training and technical support with the technology available, administrator priorities and support, resource allocation and convenience, and reduction of workload. Chapter 5 provides the summary, conclusion, implications for practice and discussion, and recommendations for further research.

CHAPTER V – SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

Technology has affected almost every facet of our lives. From how we work and communicate, to entertainment and personal behavior, various computerized tools assist us in being more efficient and effective at our tasks. Interestingly, however, technology has not yet become a mainstay within our public school systems (Ertmer, 2005). Teachers have access to computers and computer assisted devices, but there are significant barriers for teachers to fully embrace and adopt new technologies in the practice of teaching and learning (Bender & Waller, 2013). Additionally, teachers new to the profession – who may be early adopters of technology themselves – are not adequately trained in the use of technology in the classroom (Trilling & Fadel, 2009). Therefore, it is necessary to better understand how technology fits within the classroom and the barriers limiting effective and sustainable implementation.

The purpose of this mixed-methods study was to explore the perceived barriers and concerns of elementary teachers when implementing new technology available in interactive television labs (ITVL). The ITVL innovation has been present in the school district's four elementary schools since the fall of 2008. The ITVLs technology includes an interactive whiteboard, student desktop computers, a teacher station with various technologies and a two-way interactive television to connect with anyone in the world with the same capabilities. In order to identify the barriers and concerns, the researcher studied the end users of the new technology, the teachers. Both a quantitative and qualitative approach was taken to research the school district in the study. A web-based survey was sent to 100 teachers to collect data on the stages of concern (SoC). The survey was based on the Concerns Based Adoption Model created by Hall and Hord

(2006), designed to flush out the concerns of a new innovation being implemented. The word innovation was replaced with ITVL to reflect the purpose of the study. The web-based survey had thirty-five Likert scale questions with two open ended questions. The study included one-legged interviews with eight teachers, two from each of the four elementary schools with the district studied. The researcher also conducted a focus group session with all eight teachers participating in the individual interviews. The SoC data was analyzed and individual profiles were created for each of the forty teachers that completed the survey out of the 102 teachers within the school district. Interviews were transcribed and analyzed by the researcher by coding and drawing out common themes. Barriers of technology integration were identified and each of the eight teachers interviewed provided an opportunity to connect the stages of concern to the common barriers that existed in using the ITVL technology in everyday lessons. The researcher gathered the information in order to understand how these barriers undermine the teachers' use of the new technology by asking the following questions:

RQ1 (Quantitative): What are the stages of concern of elementary teachers when implementing the new technology innovations within the ITVLs?

RQ2 (Qualitative): How do the perceived barriers affect the implementation of new technology from the ITVLs?

Summary of Findings

Individual profiles were created for the 39 teachers that completed the SoCQ questionnaire and the Stages of Concern was defined (Table 1). The results showed higher scores in Stage 0 (Awareness) and Stage 5 (Collaboration). Twelve of the participating teachers were rated highest in Stage 0, while eleven teachers were rated highest in Stage 5. Three teachers scored highest in Stage 4 and nine teachers scored highest in Stage 2. Two out of the thirty-nine teachers

scored highest in Stage 6, while two also scored highest in Stage 1 and five scored highest in Stage 3 (Table 2). Major themes were identified by interviewing eight of the thirty-nine teachers and holding a focus group session with all eight participants. Two teachers from each of the four elementary schools were interviewed. One-legged interviews were conducted and transcribed. The researcher identified four major themes through coding and sorting common words and phrases. Barriers were identified through this process. Table 4 shows the major barriers identified in the study.

Table 5. *Identified Barriers to Technology Integration*

Barrier	Description
1. Teacher training and support	Lack of on-site support/training
2. Administrator priorities and support	Leadership focused on other areas
3. Resource accessibility and convenience	ITVLs location/accessibility
4. Reduction of workload	Curriculum and practices are overwhelming

A summary of the conclusions for each research questions are provided:

Identified Stages of Concern of the Teachers

It is important to remember that teachers move through the Stages of Concern in a fluid, non-standard way. As they become more comfortable and confident with one technology tool, they may move back to Stage 0 (Awareness) when a new innovation or skill is introduced.

Teachers that scored a high intensity in Stage 1 (Informational) reflected the fact that they were interested in learning about the new ITVLs. Teachers in this stage were concerned about how to use technology in a more convenient way. Time and support is needed when working with the teachers in Stage 1. Teachers in this stage worry about technical support, accessibility of the technology. Reduction of workload is also a concern when time and support are available.

All eight teachers showed a lack of confidence in using the ITVLs on a daily basis. This was reflected in a variety of ways depending on the teacher and if they were trained in using the ITVLs. Teachers scoring high in stage 0 or 1 simply did not have the experience in the ITVLs to use the technology effectively. Teachers scoring high in stage 4, 5, or 6 may be confident in using the technology, however, did not feel they could use the ITVLs as a constant part of their class. They felt they did not have the skills yet to provide true technology opportunities for their students. Teachers scoring high in Stage 3 reflect the fact that some teachers were focused on short-term use of the ITVLs and not looking at the long tern benefits of the technology. Stage 3 (Management) points to teachers that know about the ITVLs, are interested in using the technology, however are looking at how they will build it in their day and make it purposeful. The barrier of administration support and workload reduction is present for these teachers. They may be willing to take risks and be creative if they have time and are supported by their principal.

Teachers scoring high at Stage 6 can mean that they have conquered their fears and are ready to take steps to use the ITVLs on a daily basis and look at other options for technology integration. They may have broken through the barriers of time, training, and work reduction, and still need support from their principals and other leaders. Teachers at the refocusing stage will often move to another innovation and experience the Stages of Concern all over again. Teachers in Stage 6 (Refocusing) often have changed mindsets and are ready to take on other challenges.

Stage 4 (Concerns) reflected teachers concerns about their use and how they might integrate the technology. While this is expected, administrators must look to the student for planning technology integration plans. Teacher training and support is a common barrier when it

comes to how the technology will be integrated into the curriculum. When teachers move through stage 0-3 and begin looking at how and why, more professional development must be given but the focus should be placed on student achievement.

Identified Barriers to Implementing Technology

The results of the SoCQ provided a descriptive profile of both the eight teachers interviewed and provided a profile for the school district as a whole. The interviews provided rich empirical data in which to better identify the barriers surrounding technology implementation within a school setting. It is essential to review teacher use periodically in order to give change facilitators (administration) information on what interventions should be addressed. In fact, the ITVL innovation and other technology tools teachers' use within their classrooms should be viewed as a long-term process. Results of this study point to the majority of teachers at the lower end of the stages of concerns even after the ITVL innovations have been present for more than one year. It is noted that teachers' stages of concerns cannot be forced (Hall & Hord, 2006). Based on the various themes that emerged in the data, the following conclusions were identified:

Lack of Training and Technical Support

1. In order to ensure successful implementation of a new technology initiative, the teachers must be provided appropriate training and technical support. Teacher development is at the core for innovation adoption. They cannot accomplish innovation adoption just by announcing an order or placing technology in a classroom. Teachers need assistance and guidance to move from one stage to another stage of concern. The support must be readily accessible and must be in real time. Creativity and risk taking are often squelched by technical problems and failure to troubleshoot when the technology is not working the way the teacher

needs. Support must be present as teachers learn how to use the technology and to help foster an environment that advocates new instructional practices that the technology provides. Professional development is most effective when it is consistent, sustained over time, and embedded within the daily routine of a classroom teacher (Darling-Hammond, Wei, Andree, Richardson, & Orphanos, 2009). Training and support must be embedded in staff meetings, professional development days, and other times where teachers can practice using the new innovations in the setting they are most comfortable. The perceived barrier of time and support hinder true sustainable change (Marzano, 2003).

Lack of Administrator Priorities and Support

2. The principal and school administrators are a key element in the successful implementation of a change initiative. Fullan (1993) pointed out for innovation, pressure and support are important motives. Pressure without support leads to resistance and alienation, while support without pressure leads to drift and waste of resources. Principals who practice instructional technology leadership model the use of technology within the school and the classroom. Support, involving the teachers in technology decisions, and modeling risk taking is crucial in moving toward a technology-rich environment. The different approaches a principal uses will influence a teacher (Liu, Ritzhaupt, & Cavanaugh, 2013). Leaders must make it a priority to understand their staff and learn about their learning styles. Teachers move through the Stages of Concern and are often fluid when it comes to building on their knowledge and skill levels. School leaders that continue surveying, discussing, and providing opportunities of collaboration wrapped around technology integration will see positive results.

Principals and other administrators are often leading the charge in creating technology plans. A clear plan and shared vision is key when moving a school or district to become relevant

in today's world. Teachers, parents, and even students must be part of the process when laying out how technology will be used and why it is important to integrate within the classroom.

Lack of Resource Accessibility and Convenience

3. Teachers need to have access to the necessary tools and information in order to effectively implement these elements into their curriculum. Teachers are being pulled in many directions and have limited time during the day. Technology must be accessible and convenient (Shaw, 2011). The ITVLs were located in one room within the schools. Teachers had to take time to line up the students and walk them to the ITVLs, often finding that someone else was using the room for non-technology activities. Teachers want full accessibility to new innovations in order to easily transition the tools into activities without disrupting the day. Time is scarce and the expected curriculum is daunting. Technology should be available when a teacher is ready to integrate. The ITVLs provided a technology-rich environment that was not readily accessible to all and often was used for other reasons during the day. Technology has become less expensive and many schools are moving to a "bring your own device" policy allowing students to use their own smartphones or computers. Schools must take advantage of this and support their teachers in learning how to manage and integrate the technology.

Inability to Reduce Teacher Workload

4. There must be recognition that teachers need extra time to integrate technology into their teaching. The possibility of the common core state standards and smarter balanced assessment expectations coming in 2014-2015 has placed an enormous amount of pressure on both administrators and classroom teachers to improve student growth (Kendall, 2011). Teacher evaluations are a high stakes process and educators are experiencing pay reductions across the state. The lack of time creates problems for teachers when it comes to technology integration by

increasing more time in planning, preparing, and searching for resources to make the lessons successful (Dede, Honan, & Peters (2005). Many times in education new practices or new curriculum expectations are not looked upon as replacements but rather add-on to a teacher's workload. Technology should be used to reduce the time a teacher uses to plan, collaborate, and deliver instruction. New technologies are available, such as Google Docs or Edmodo that provide tools to save time, not add time to a teacher's day. When used properly, technology can be a benefit to both a teacher and the students. "…technology should be like oxygen, ubiquitous, necessary, and invisible. In the end, it's not about the technology, it's about the people using it and how they use it (McLeod & Lehman, 2012). School districts must build in time to look at what can be reduced from a teacher's workload and what supports must be in place for them to transition to new processes and delivery systems.

Implementation occurs when teachers interact with and support each other as they take risks with the new innovation. A strong foundation of trust and collegiality, along with a commitment to continuous improvement will give teachers a chance of working through the perceived barriers and transition from one stage of concern to another at a rapid pace.

Conclusion

The summaries of the research questions above lay out the findings of this mix-method study. The purpose of the study was to understand the stages of concern among elementary teachers in using new technology innovations and how the perceived barriers may undermine the implementation of the technology located in the Interactive Television Labs (ITVL). The researcher concluded that the teachers' stage of concerns as measured by the CBAM, and the perceived barriers that were evident from the interviews, were both factors in the successful implementation of technology among elementary teachers. Although this study did not test for

correlation between the teachers' concerns and their perceived barriers, it was evident in the interview responses that the perceived barriers contributed to the teachers' concerns.

This link was non-linear and changed depending on the innovation and the situation in which they are using the innovation. The researcher found that while there were connections between a teacher's stage of concern and a perceived barrier, he also concluded that there were associations between perceived barriers and the stage of concern the teacher was currently experiencing.

For example, a teacher may have a technology coach in her classroom for one day a week and have the opportunity to co-teach a lesson. The teacher's stage of concern score may reflect a higher stage due to the absence of barriers such as lack of support and troubleshooting. The classroom teacher may be in Stage 5 (Collaboration), ready to learn and ready to use the innovation on the day she has help. The next day, the teacher may teach the same lesson without the technology coach present, and her stage of concern may fall back to Stage 0 or Stage 1. It is hard to distinguish between what affected what, the stage of concern or the perceived barrier. Because of this conclusion, educators must continue to survey staff, meet face to face, and talk about perceived barriers in order to identify what must be put in place to overcome the challenges in implementing technology.

Implications of Findings and Discussion

This study examined the implementation of new ITVLs in the four elementary schools located in one northern Genesee County school district. The findings of this study are similar to those of previous research, as discussed in the literature review. Providing additional support for work on technology integration, the findings provide evidence of the challenges of technology implementation in elementary schools, based on the perceived barriers of the teachers. These

conclusions provide additional support to the notion that the technology implementation is itself a form of change, and therefore needs to be thoughtfully planned and managed.

Following is a discussion of the main implications that were drawn from this research:

Change is a Marathon, not a Sprint. Hall and Loucks (1978) emphasized we should consider change as a process not an event. The results of this study provided additional support to the notion that technology is a long-term investment. Educators cannot have the expectation that instant returns on investment will be possible. The teachers concerns are key in moving over barriers and through the various stages of concern and perceived barriers of change (Kotter, 1995). The results of this research only identified teacher concern of perceived barriers at a particular period of time; it will benefit the schools to revisit the stages of concerns at other points of time to determine what professional development is needed and identify teachers that have been successful (Hall & Hord, 2001).

Concerns will change as time passes. Fulton (1982) pointed out that an innovation implies learning must take place. During the innovation process, intensive care must be present for teachers' concerns and frustrations. When teachers' concerns were ignored, it led to less interest to make further improvements. The research showed a higher stage of concern for teachers that participated in some sort of professional development focused on the ITVL, specifically the Pioneer program. Teachers not interested in an innovation will have no motivation, continue along the lines of the status quo, and have an unwillingness of change (November 2010). Change resistance will follow these characteristics which causes more barriers for innovation use. What teachers perceive as barriers to change may not be what the change facilitators (administration) see as barriers. Sometimes when the administration rolls out innovation such as the ITVL, teachers may have interpretations of the administrators work or

different feelings about the innovation.

The change process or procedures may seem effective in the eyes of the administration, but the teachers may not agree (Wirth, 2004). The viewpoints and perspectives of the administration are important but the viewpoints of the end user, the teachers and students, cannot be ignored (Hall and Hord, 2006). An open environment, free of judgment, is important to set the stage of honest and helpful feedback. Teachers learn best and are eager to take on challenges with innovation when professional development incorporates new approaches that they can experiment with and reflect upon their experience in a safe environment (Fulton, 1989).

Addressing Teacher's Immediate Concerns. Hall noted in his research that at the beginning of the change process, nonusers (teachers not using the ITVLs) would be relatively high at stages 0,1,2 and when they begin using the innovation, stage 3 (Task concerns) would become more intense with stage 0,1,2 concerns decreasing in intensity and the impact concerns, stages 4,5,6, would become more intense (1979). The results of the research disclosed that teachers did not feel confident in using the ITVLs for teaching and learning. It was clear teachers in the school district were remaining in stages 0,1,2, and 3 after three years of the innovation being available. Interventions should be designed to address the more intense informational and management concerns. Understanding first and second order change would benefit the school district and help them design training that fits individual teacher needs (Marzano, 2005). The school district should provide more information and training to meet the needs of the teachers in stages 0,1,2,and 3 in order to support their transformation to stages 4,5,and 6. This will advocate for an environment where teachers are eager to take risks and help each other learn new innovations.

This research showed much of the information came from the intermediate school district

and fell short when being disseminated across the whole staff. Those teachers participating in the Pioneer program received emails along with the building principal. The email communications of various programs or events that could be accessed through the ITVLs did not reach many of the teachers. Ultimately, a small number of teachers participated in the professional development and was able to gain helpful information in how to use, what to use, and why to use the innovation. Face-to-face meetings, such as staff meetings or professional development opportunities, are important (Fullan, 2007). Evident in the focus group session and the individual interviews was the effect a building principal's support and motivation are on using innovations. School leaders must focus on the end user, the teacher (Kim, Kim, Lee, Spector & DeMeester, 2013).

The change process must include the administrator's understanding of the teacher's concerns (Hall & Hord, 2011). Many times during the change process when an innovation is introduced, administrators will encourage teachers to come see them if they have concerns or questions. It is often assumed if teachers do not come to seek help, they are satisfied the teacher is confident with the innovation. It's important for leaders to not assume that no response means teachers do not have questions or concerns. No response may mean teachers are in stages 0,1,or 2 and are not confident or are desperate which can translate to silence. During the change process, principals should invite teachers for face-to-face meetings, model the use of the innovation, survey the staff, and create other opportunities for teachers to express concerns.

Teachers intense in stage three (management) held characteristics relating to efficiency, managing the equipment and time demand. These teachers will focus on the processes and tasks of using the innovation. It's important for school administrators to address these issues. Technology training opportunities should be made available to all teachers. These workshops

should include both technical training and training on how a teacher's role will change when embedding the innovation (Lawless & Pellrgrino, 2007).

It was made clear in the research that one-day training sessions, or trainings far apart, were meaningless. Teachers need routine, consistent trainings including using the innovation within the classroom while being coached, or supported, during the lesson (Smoekh, 2008). The assumption of having a small group of teachers trained, having them come back to the building to train other teachers could prove to be a failure of systemic change. Teachers need time to practice, digest their failures and learn from them, and reflect with colleagues (Norris, Sullivan, Poirot & Soloway, 2003). This needs to be a long, consistent training model, not a few days of workshops. Further, technical support must be available in real time to enhance teacher confidence and remove the barrier of equipment problems.

Adjusting the Focus. The focus group discussion and individual interviews with the eight teachers revealed an interesting factor, the barrier of confusion. Teachers did not know exactly know what the their role was in embedding the ITVL innovation. Some teachers could not articulate what the expectation was of the district in using the technology. They seemed anxious about their technical skills and reported spending much of their time learning the techniques of handling the computers and applications rather than focusing in on how the technology could enhance instruction. The focus was on technical skill, not student learning outcomes. The training offered at the local intermediate school district to the Pioneer group focused on *what* and *how*, rather than *why*. Focusing in on the *why*, student engagement, and instruction enhancement provides teachers with the motivation to learn about and use the innovation (Ertmer & Ottenbeit-Leftwich, 2009). When teachers focus on how students learn or how much learning is increased with the help of the ITVL, their passion for learning will be

enhanced and will override the frustration of the lack of technical skills (Ertmer, 1999). Trainings fell short to cover the *why*. Trainings on technical use, without consistent review and support, led to teacher frustration and confusion. The costs outweighed the benefits in their minds and became an internal barrier.

The shift in focus is a true shift in mindset. Carol Dweck's (2007) definition of a growth mindset explains how educators must take risks and continuing improving their craft. A growth mindset in schools can advocate for continuous growth and help support technology integration as new tools are brought into the schools each year.

The following is an example of a growth mindset (Blackwell, L.S., Trzesniewski, K.H., & Dweck, C.S. (2007):

- Administrators support teachers' learning. They are responsive to honest feedback, rather than defensive. They seek to build their skills, and are willing to learn from their teachers.
- Teachers collaborate with their colleagues and instructional leaders, rather than shut their classroom doors and fly solo. They strive to strengthen their own practice, rather than blame others. They truly believe that all students can learn and succeed—and show it.
- Parents support their children's learning both inside and outside the classroom. They partner with teachers, and respond to outreach. They worry less about advocating for their children to get good grades and focus on making sure kids are being challenged and put in the effort needed to grow.
- Students are enthusiastic, hard-working, persistent learners. They take charge over their own success.

Understand First- and Second-Order Change and How it Affects Teachers. Order of change is the magnitude and implications of changes for the people expected to implement them or those who will be affected by them (Waters, Marzano, & McNulty, 2003).

First-order change is an extension of an existing situation or process, and can be implemented with current knowledge and skills (Ertmer, 2005). Second-order change implies a fundamental or significant break with past and current practices and requires new knowledge and skills (Ertmer, 1999). In terms of the implications change had or will have on the teaching staff within the four elementary school studied in regards to the ITVL, what is first-order change for one may be a second-order change for another. Providing professional development to match the individual needs will be essential in moving forward.

The school district and individual buildings can build a long term, systemic professional development plan based on first- and second-order change factors. First-order change is present with the ITVL innovations if teachers see the change as consistent with existing values and norms, advantageous, and readily implement-able with existing knowledge and resources. Second-order change is present when teachers are unclear about how it will make things better for them, must master new knowledge, practices, or approaches to implement the change, and feel the change conflicts with prevailing personal values and organizational norms (Waters, 2003).

The results of the interviews and focus group session pointed to the need for second-order change to take place. The belief that the ITVL was there for technology sake only was present in both the pioneer group and the group that did not receive training. The second-order change of looking at instruction in a different way is important as the curriculum and instructional practices shift to match the new standards present in the nation today. Technology is a needed entity if

students are to be prepared for college and careers (Wagner, 2008, Trilling & Fadel, 2009, Jacobs, 2010).

Marzano, Waters, & McNulty (2003) set forth seven responsibilities leaders have to take on for a successful transition with second-order change. They also show three findings that is important to point out. School-level leadership impacts student achievement, principals use sixty-six leadership practices to fulfill twenty-one essential responsibilities that correlate with student achievement, and strong principals can have either a positive or negative impact on student achievement. The seven essential responsibilities of district and building leaders to succeed in second-order change:

1. Change Agent
2. Flexibility
3. Ideals & beliefs
4. Intellectual stimulation
5. Knowledge of Curriculum, Instruction, Assessment
6. Monitor and evaluate
7. Optimizer

Change agents challenge the status quo (Fullan, 2007). Leaders must constantly challenge teachers to move away from their every day routines and build in the technology within the ITVL, or other available technology. Change agents are always looking for better ways to do things. Flexibility means leaders are comfortable with dissent or actions that are looked upon as risk taking. The leader must feel comfortable with leading change. The school district must have clear and concise ideas and beliefs that are communicated to the end user, the teachers (Hall & Hord, 2011). The communication must be met with modeling of the expected

behavior (Liu, Ritzhaupt, & Cavanaugh, 2013).

Leaders through second-order change must have extensive knowledge of how curriculum, instruction and assessment align and must take on the charge of discussing these issues with all stakeholders (Ertmer & Ottenbriet-Leftwich, 2009). Conversations must include best practices, up to date topics, and the relationship between the changes and the learning that it will entail. The change must be evaluated, monitored, and constantly on the forefront. Leaders must encourage, support, and inspire the end user to affirm their efforts to change. Additionally, leaders must be willing to live through a period of frustration and even anger from some staff members (Marzano, Waters, & McNulty 2003).

Fullan and Hargreaves (1992) stated those individuals and organizations that are most effective do not experience fewer problems, less stressful situations, and greater fortune; they just deal with them differently. Schools that identify the barriers, discuss them openly, and create action plans based on first- and second-order change have a greater advantage of becoming successful at what they want to succeed at. There are negative factors associated with second-order change that successful schools know about ahead of time and plan for.

The negative factors identified by Marzano, Waters, McNulty (2003):

- Culture: strongest negative relationship to second-order change because common language, understanding, and team spirit have all been influenced because of the innovation
- Communication: people resisting the change do not have the ears to hear
- Policies and Procedures: implementation has caused changes in some of the policies and procedures staff have come to understand and love

- Stakeholder Input: people resisting the change do not have the ears to hear. Often times when you ask for input, their suggestion is to revert to former practice

School districts, such as the one studied, must be cautious when transitioning through second-order change. While first-order change may be on the surface and is hard enough to keep up with, it is the second-order change that transforms a school.

Recommendations for Further Research

The findings of this study offer implications for future researchers who may be interested in studying technology implementation and the barriers associated with successful change. This study took place in one school district, with four elementary schools.

As the use of technology within classrooms becomes more widespread, school leaders need to be adept in leading change and supporting teachers in the change process. Therefore, research in effective technology integration, the change process, and successful leadership practices need to continue so that teachers and students can reap the benefits. Recommendations for further research include the following:

- Analysis and further development of the interview questions may lead to further research and a deeper understanding of one's perceived barriers to technology integration. Different minds of experienced researchers may find ways to adjust the questions to provide more clarity and garner more insightful or relevant responses to study the change process and present barriers.

- Replicate this study with more teachers within the county that includes twenty-one public school districts and six charter schools. This research is a good start, but is certainly too small for the results to be considered conclusive and to provide results to help the county

make important technology decisions.

- Expand this study to include related demographics, such as school districts outside of Genesee County that have brought in new innovations for teachers.
- Reach beyond the elementary levels and include middle and high school teachers. There are a number of elements of technology integration that would be very similar in those settings. Replication of this study into those other grade levels may provide interesting insights that could add to the body of knowledge regarding barriers to technology integration.
- Expand teacher profiles to include years taught, male or female, degrees, and other factors to see if there are teacher profiles more likely to move through the Stages of Concern faster or are more comfortable with change.
- Expand on the research of the change process and barriers of technology integration to include implications in student achievement, curriculum design, instructional methods, student engagement, and other important aspects of K-12 education.
- Test for correlation between the identified concerns and perceived barriers to the technology implementation. By applying additional quantitative analyses, future research could better understand the relationship between these variables and how the barriers contribute to the teachers' concerns.

Dissemination

The findings from this study will be disseminated in a number of ways. This dissertation will be published in a hardbound book, and a copy of it will be placed on the campus of Eastern Michigan University. An electronic version will be made available on the Internet. The researcher will share the results with the school district studied and the intermediate school district. He will also provide opportunities for discussion and training to the school district

studied, free of charge. Finally, the researcher may publish the results of this research in appropriate scholarly journals.

Summary

Chapter 5 provided a summary of the findings, conclusion and implications of the findings and discussion, as well as recommendations for possible topics of further research. This research provided empirical evidence to the barriers of technology implementation and the relationship between the perceived barriers and the stages of concern of elementary teachers of that implementation, based on data from one school district. The results of this study should be used as a basis for additional research in the area of technology implementation and the change process. Continued research in the areas of technology, curriculum, instructional methods or other program implementation, in addition to change initiated by school administration, may allow principals to establish and maintain a productive work environment in order to improve student outcomes.

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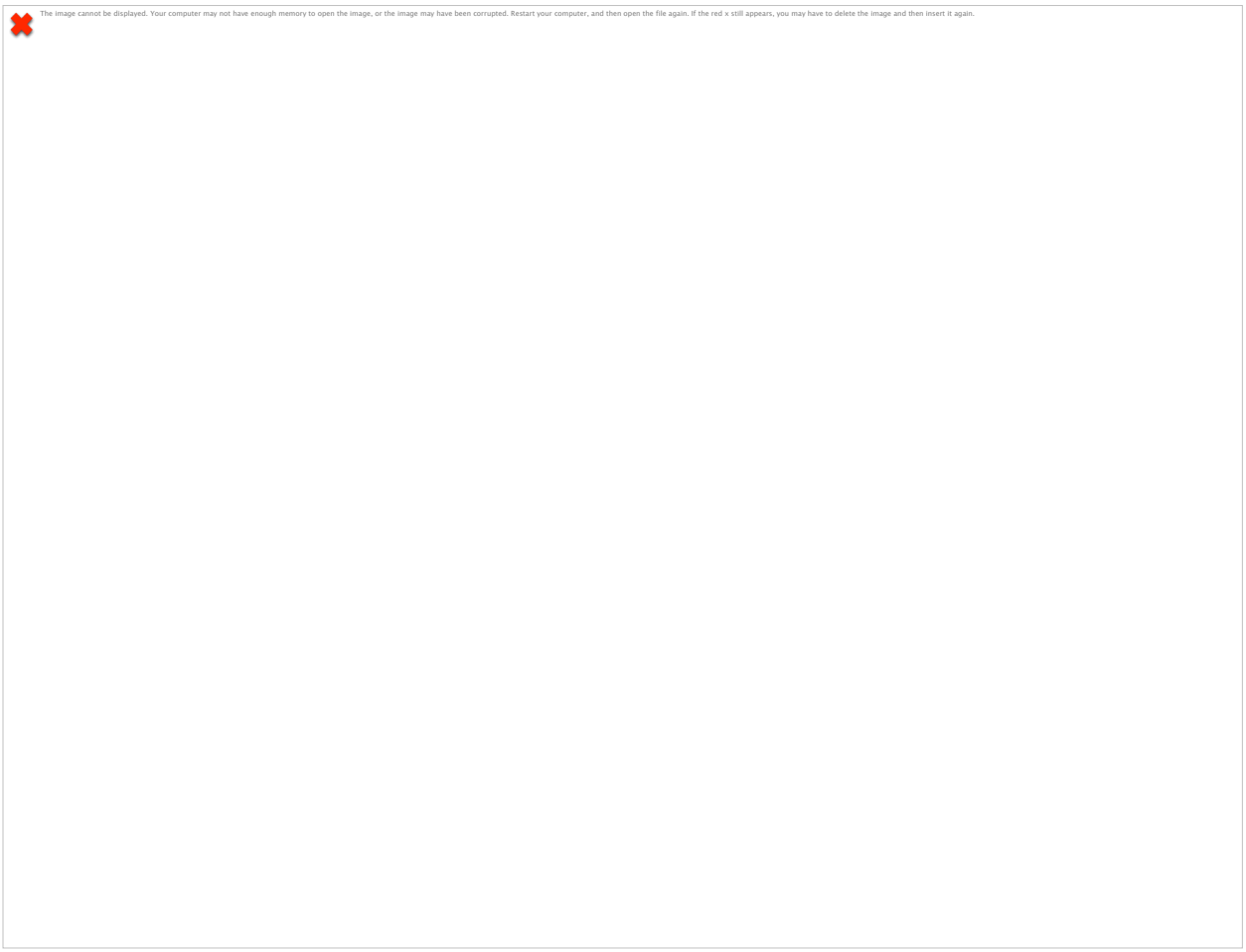
Appendix A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Appendix B

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Appendix C

Stages of Concern Questionnaire

Emailed through Survey Monkey (www.surveymonkey.com)

0	1 2	3 4 5	6 7
Does not apply	Not true of me now	Somewhat true of me now	Very true of me now

1.I am concerned about my students' attitudes toward the ITVL.	0-7
2.I now know of some other approaches that might work better when using the ITVL.	0-7
3.I am more concerned about using another technology tool than what is in the ITVL.	0-7
4.I am concerned about not having enough time to organize myself each day.	0-7

5.I would like to help other teachers in their use of the ITVL.	0-7
6.I have limited knowledge of the ITVL.	0-7
7.I would like to know the effect the ITVL will have on my professional status.	0-7
8.I am concerned about conflict between my interests and my responsibilities regarding the ITVL.	0-7
9.I am concerned about revising my use of the ITVL.	0-7
10.I would like to develop working relationships with both the people on staff and outside the staff using the ITVL.	0-7
0 1 2 3 4 5 6 7 Does not apply Not true of me now Somewhat true of me now Very true of me now	

11. I am not concerned about the ITVL at this time.	0-7
12. I am concerned about how the ITVL affects my students.	0-7
13. I would like to know who will make the decisions about the ITVL.	0-7
14. I would like to discuss the possibility of using the ITVL.	0-7
15. I would like to know what resources are available if I decide to use the ITVL.	0-7
16. I am concerned about my inability to manage all that the ITVL requires.	0-7

17. I would like to know how my teaching is supposed to change.	0-7
18. I would like to familiarize other teachers with the progress of the ITVL.	0-7
19. I am concerned about evaluating my impact on students regarding the ITVL.	0-7
20. I would like to revise the ITVL's use in my teaching.	0-7
21. I am preoccupied with things other than the ITVL.	0-7
0 1 2 3 4 5 6 7 Does not apply Not true of me now Somewhat true of me now Very true of me now	

22. I would like to sometime modify my use of the ITVL based on the experiences of my students.	0-7
23. I spend little time thinking about the ITVL.	0-7
24. I would like my students to get excited about integrating in the ITVL.	0-7
25. I am concerned about time spent working with nonacademic problems related to the ITVL.	0-7
26. I would like to know what the use of the ITVL will require of me in the immediate future.	0-7
27. I would like to coordinate my efforts with others to maximize the ITVL's effects.	0-7

28. I would like to have more information on time and energy commitments required by the ITVL.	0-7
29. I would like to know what the other teachers are doing in the ITVL.	0-7
30. Currently, other priorities prevent me from focusing my attention on the ITVL.	0-7
31. I would like to determine how to supplement or enhance the ITVL.	0-7
32. I would like to use feedback from students to change the ITVL.	0-7
0 1 2 3 4 5 6 7 Does not apply Not true of me now Somewhat true of me now Very true of me now	

33. I would like to know how my professional role will change when I am using the ITVL.	0-7
34. Coordination of tasks and people regarding the ITVL is taking too much of my time.	0-7
35. I would like to know how the ITVL is better than the tools I am using now.	0-7

36. What are other concerns you have at this time?

37. Briefly describe your position and responsibilities.

Please Mark Yes or No

I will volunteer for an individual, confidential 20-30 minute interview with the researcher and participate in a focus group session consisting of 6-8 teachers. Please contact me at_____to make an appointment that fits into my schedule.

Appendix D

Interview Protocol

INTERVIEW GUIDE

1. How did you become aware of the ITVL? What did you think about it at first?
2. Did you implement technology into your lessons before the ITVL? If so, what technology did you use and how did you use it?
3. What led you to consider the possibility of using the ITVL?
4. What were the reasons that finally persuaded you to use the ITVL?
5. How do you continue to receive information about using and improving the use of the ITVL?
6. Can you describe your experience in implementing the ITVL into your lessons? If you have implemented technology from the ITVL: How did your experience designing this lesson to include the ITVL compared to designing a lesson that did not?
7. What are the barriers to using the ITVL? How do you deal with those barriers?
8. What are the benefits of having the ITVL?
9. What advice would you give to other teachers who are looking to implement the ITVL into their lessons?
10. What are the challenges of teaching in the ITVL?
11. What was your experience in managing the new ITVL technology?
12. What are the challenges regarding the organization and management of the ITVL?
13. What challenges have you experienced with scheduling time for the ITVL?
14. What advice would you give to other teachers regarding organizing and managing the ITVL?
15. What did you experience with technology issues when using the ITVL?
16. What advice would you give other teachers regarding using the technology in the ITVL?
17. After teaching using the ITVL technology, what would you do differently the next time? Please explain why.
18. Do you plan to teach using the ITVL again? Why or why not? Why do you continue to teach using the ITVL?
19. What could have been provided to you during your professional development training that would have made the implementation of the ITVL more efficient and effective?
20. Now that you are experienced in using the ITVL technology, do you have any additional needs regarding ITVL implementation?
21. Anything else you would like to share that we haven't discussed?

Focus Group

Discussion Questions

Tell me about your school building as it pertains to implementing the technology from the ITVL.

Tell me about your district as it pertains to implementing the technology from the ITVL.

Tell me about your principal when it comes to implementing the technology from the ITVL.

Talk to me about technology use and how technology decisions are made in your building. (your district).

Tell me what a typical week may look like for you as a staff member when it comes to implementing technology into your lessons.

As a staff, what do you feel happens in this school that allows you to do your best in implementing technology?

As a staff, what do you feel happens in this school that hinders you from doing your best in implementing technology?

Do you believe technology is important to student learning?

What do you believe is the three biggest barriers to implementing technology from the ITVL?

Appendix E

Dear Flushing Elementary School Teacher,

You are invited to participate in a research project that examines elementary teachers' concerns regarding perceived barriers in implementing a new innovation. This research project is part of my doctoral dissertation being obtained from Eastern Michigan University. The SoCQ (survey) will take 5-10 minutes to complete. At the end of the survey you will be asked if you are willing to participate in a 30 minute interview. If you agree to participate in the interview you will be contacted via school email with a written informed consent form attached, and asked to set up a time that is convenient for you. Participants in the interviews will also be asked to take part in a focus group discussion that will consist of 8 teachers.

The results of this project will be used in my doctoral dissertation that is examining the perceived barriers of integrating technology among elementary teachers. Through your participation, I hope to understand the concerns of teachers regarding the perceived barriers that are present when implementing the interactive television labs in your school (ITVL). The information obtained from the surveys and interviews will be useful for continuing to enhance technology integration within schools in order to improve instruction. Additionally, the dissemination of results will be through the dissertation and any related professional publications or presentations. No identifiable information will be shared. Participants may discontinue involvement at any time.

All of your survey answers are confidential and guaranteed not to be identified with you personally. If you choose to be interviewed, I will conduct and transcribe the interviews. The interviews will be recorded on a cassette tape to enhance accuracy. When the interview is transcribed, the recording will be destroyed. Likewise, survey results will be destroyed after the results are complete. The informed consent form, with your real name, will not be matched with the data, and your participation will be kept confidential.

Your participation in this study is voluntary, and there is no penalty if you do not participate. To receive a summary of the results, e-mail ah07bps@birmingham.k12.mi.us.

If you have any questions or concerns about participating in this study, you may contact me at ah07bps@birmingham.k12.mi.us or 248-867-7929. You may also contact the Eastern Michigan University Human Subjects Committee for any questions regarding the consent agreement and research protocol approval procedures: Dr. Deb deLaski-Smith, Interim Dean of the Graduate School and Administration Co-chair of UHSRC, human.subjects@emich.edu, 734-487-0042.

Adam Hartley

Instructions for Completing the

Stages of Concern Questionnaire

The purpose of this questionnaire is to determine what teachers, who are using or thinking about using innovations, are concerned about at various times during the innovation adoption. The innovation that this questionnaire addresses is the Interactive Television Labs (ITVL) installed in your building in partnership with the Intermediate School District. The questionnaire refers to the ITVL as the innovation.

These items were developed from typical responses of school and college teachers who ranged from no knowledge at all about innovations to many years of experience in using them. Therefore, a good portion of the items on this questionnaire may appear to be of little relevance or irrelevant to you at this time. For the completely irrelevant items, choose "0" on the scale. Other items will represent those concerns you do have, in varying degrees of intensity, and should be marked higher on the scale.

For example:

This statement is very true of me.	0 1 2 3 4 5 6 **7**
This statement is somewhat true of me.	0 1 2 3 4 **5** 6 7
This statement is not at all true of me.	0 **1** 2 3 4 5 6 7
This statement does not apply to me.	**0** 1 2 3 4 5 6 7

Please respond to the items in terms of your present concerns, or how you feel about your involvement or potential involvement with the ITVL. Thank you for taking time to complete the survey.

Adam Hartley