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Beliefs about Technology Integration Support Factors Held by School Leadership and School Faculty: A Mixed Methods Study

Katherine Williams

ACCEPTANCE

This dissertation, BELIEFS ABOUT TECHNOLOGY INTEGRATION SUPPORT FACTORS HELD BY SCHOOL LEADERSHIP AND SCHOOL FACULTY: A MIXED METHODS STUDY, by KATHERINE WILLIAMS, was prepared under the direction of the candidate's Dissertation Advisor Committee. It is accepted by the committee members in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the College of Education, Georgia State University.

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ABSTRACT

BELIEFS ABOUT TECHNOLOGY INTEGRATION SUPPORT FACTORS
HELD BY SCHOOL LEADERSHIP AND SCHOOL FACULTY:
A MIXED METHODS STUDY
by
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Teachers' beliefs have been identified as a barrier to classroom technology integration. School leadership support that reduces or removes integration barriers can assist teachers in the move from traditional teaching beliefs and practices towards successful classroom technology integration. This mixed methods study investigated beliefs of school leaders and teacher participants concerning support factors that affect technology integration from a mid-sized suburban public school system in the southeastern United States. The quantitative phase of this study included 556 school leaders and teachers. The quantitative survey *Beliefs about Teaching with Technology (BATT*) measured the school leaders and teachers' beliefs concerning support factors that affect technology integration. A MANOVA was used to identify significant differences between the two groups and to select the extreme cases for the second phase of the study. An extreme case was defined as one in which the school leaders and teachers had a statistically different view of the beliefs about teaching with technology. Significance was found at the $p = .001$ level in all categories of beliefs investigated.

This qualitative phase of the study included participants from three extreme case schools. Interviews with key informants further explored the differences in beliefs

between three leaders and nine teachers and identified differing perspectives between their beliefs about factors that support technology integration in their schools. These interviews also provided descriptions of behaviors related to individuals' beliefs about these factors. The constant comparative model was used for interview analysis.

If classroom technology integration is to be successful, leaders and teachers in a school should possess similar beliefs about the availability and nature of the school-based support, resources, professional development, vision, and incentives necessary to encourage change within a school environment. This study identified the existence of differences in such beliefs between these two groups in one school system, a necessary step before conducting further research on the impact these differences in beliefs could have on individuals' behaviors related to the successful integration of technology into classroom instruction.

BELIEFS ABOUT TECHNOLOGY INTEGRATION SUPPORT FACTORS HELD BY SCHOOL LEADERSHIP AND SCHOOL FACULTY: A MIXED METHODS STUDY

by

Katherine Williams

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CHAPTER ONE

INTRODUCTION AND PROBLEM STATEMENT

The passage of the No Child Left Behind Act of 2001 (NCLB) set a historic challenge to help every child achieve at higher levels and to prepare our children for their future (U.S. Department of Education, 2002). Included in this act was a framework that supports stronger accountability for results, increased flexibility and local control, expanded options for parents, and an emphasis on teaching methods proven to work. NCLB also recommends that by the eighth grade all students should be technologically literate and repeatedly references technology as an important source of support for teaching and learning across the curriculum (Culp, Honey & Mandinach, 2003).

The types of changes required by NCLB include not only rethinking and realigning the industrial age factory model of education, but also rethinking the tools available to support such change. Schools of the information age must effectively employ technology to better meet the needs of students, parents, teachers, and administrators. Technology has the capability to be a "transforming" tool, enabling organizations and individuals to gain significant advantages in work and life. Such a transformation is needed in education.

In 2005, Congress revised NCLB to include the National Education Technology Plan written by the U.S. Department of Education Office of Educational Technology. It was developed as part of a long-range national strategy and guide for using technology

effectively to improve student academic achievement— either directly or through integration with other approaches to systemic reform. The National Education Technology Plan (2005) is meant to help motivate and incite technology-driven transformation, and it provides a set of seven action steps and recommendations that the nation's school systems can consider as they begin or continue to transform. The first of these action steps is to strengthen leadership at the school, system, and state level.

The Collaborative for Technology Standards for School Administrators (TSSA) released a set of national guidelines for school administrators (ISTE, 2003). These standards joined the already established technology standards for both students and teachers. Don Knezek, the director of the TSSA Project, stated, "Students need to know how to use technology to learn to live and do well in school. The people who guide these students to learn these skills are the teachers and the front-line administrators, so they must know how to effectively use technology as well" (National School Boards Association, 2002, p. 1). The six standards identified by the Collaborative for Technology Standards for School Administrators address the areas of (a) leadership and vision; (b) learning and teaching; (c) productivity and professional practice; (d) support, management, and operations; (e) assessment and evaluation; and (f) social, legal, and ethical issues.

Throughout the country, communities are increasingly expecting effective leadership in the area of technology from forward-thinking and insightful school leaders. Technology is not an end unto itself, and the promotion of innovation toward the goal of school improvement should include technology integration, with the goal being the improvement of teaching and learning. The world has become increasingly dependent on

technology, and both parents and students expect public education to include the integration of computers and other digital formats into the classroom. Knowing these demands and expectations, administrators who are able to assist faculty with methods to use technology to enhance the instructional process and implement and integrate technology effectively in their schools and communities will contribute greatly to both education and the economy (Slowinski, 2000).

Research Problem

Early instructional technology proponents and researchers predicted that computers, software, and associated peripherals could be the catalyst for a much needed educational revolution with a move from the traditional teacher-centered classroom to an interactive, student-centered classroom (Becker, 1994; Duhaney & Zemel, 2000; Dwyer, 1995; Pisipia, 1994; Swan & Mitrani, 1993). However, current research shows that many teachers maintain their teacher-centered or low cognitive levels use of technology in addition to their traditional teaching beliefs and practices, even after the needs of access to appropriate equipment, technical support, time to plan, and professional development on technology use and integration have been met (Petraglia, 1998; Salomon, 2002; Williams, 2001). Although research illustrates the benefits of using a student-centered approach to instruction, other researchers state this promised educational revolution in the classroom, with the exception of few limited cases, has not come to fruition (Cuban, 2001; Peck, Cuban, & Kirkpatrick, 2002).

Now that computers are reaching critical mass in classrooms (Morrison, Lowther, & DeMeulle, 1999) educators are turning their attention away from whether or not to use computers at all to how to integrate computers into instruction (Ertmer, 1999). Studies of

computers in K-12 education state that effective integration of instructional technology requires some kind of change in teacher's practice to become a less teacher-centered instructor to a more student-centered facilitator (Fuller, 2000). According to Porras and Silvers (1991), this shift in the paradigm from teacher-centered to student-centered requires a change in people's beliefs which will in turn create different behaviors. As stated by Cuban (cited in Holloway, 1998), "It is a belief system, not an economic or empirical warrant, that determines failure or success" (p.1110).

Even among exemplary users, barriers to technology integration are reported to exist (Becker, 1994). Although we cannot necessarily predict the type, order, or number of these barriers, the fact that teachers will experience a wide range of barriers is almost guaranteed. Ertmer (1999) classifies instructional technology barriers into first and second order barriers. First-order barriers to technology integration are extrinsic to teachers and include lack of access to computers and software, inadequate technical and administrative support, and insufficient time to plan instruction. Second-order barriers are those that interfere with or impede fundamental change. They are intrinsic to educators and include beliefs about teaching, established classroom practices, computer use, assessment requirements, and a willingness to change. These barriers are typically embedded in underlying beliefs about teaching and learning and may not be immediately evident to others or to the educators themselves (Kerr, 1996). Many first-order barriers may be removed by providing computer-skills training and acquiring additional resources; however, confronting second-order barriers requires questioning one's belief systems and the institutionalized routines of one's practice. Although second-order barriers may not be easily observed, their presence often can be discovered in the

comments teachers make about first-order barriers (Ertmer, 1999). While first-order barriers can be significant obstacles to achieving technology integration, the relative strength of second-order barriers may reduce or magnify the influence of the first-order barriers (Ertmer, Addison, Lane, Ross, & Woods, 1999; Miller & Olson, 1994).

Research (Dwyer, 1995; Ely, 1990a; Hamilton, 1998; Kozma, 2003; Lan, 2001; Pisipia, 1994; Sandholtz, Ringstaff &, Dwyer 1997) indicates that school leadership that reduces or removes first and second order barriers is an imperative piece of the integration puzzle if teachers are to move toward successful classroom technology integration Educational and instructional behaviors of both the school leaders and the teachers are related to their beliefs, and the integration and appropriate use of instructional technology requires a shift in the varied pedagogical beliefs of many teachers and administrators (Kagan, 1992; Parajes, 1992). Leadership should encourage and support teachers in the school to merge their varied, subjective belief systems to define legitimate goals and processes of classroom instruction, thus allowing all teachers to function as a common technical culture and not as different, competing individual belief systems practiced in isolation (Kagan, 1992).

It may be assumed by those outside of a school that leaders and teachers in a school possess similar beliefs about the availability and nature of the school-based support, resources, professional development, vision, and incentives necessary to encourage change within a school environment, as well as the same beliefs about technology integration practice that embraces an interactive learner-centered approach to instruction. But what if those beliefs are not similar but are very different between the two groups? Could a difference in beliefs between the school leaders and teachers about

the existence and nature of barriers related to support for technology integration impede the leadership from merging of the existing varied belief system of the teachers into a common culture that establishes and maintains successful integration of technology into classroom instruction? Before investigation of the influence of belief differences between teachers and leaders can be conducted, first the existence of these differences must be established. This study sought to investigate the existence of differences in beliefs between school leaders and teachers about support factors related to technology integration, and if beliefs differences existed, to describe the nature and essence of those beliefs.

Purpose of the Study

This study is based on the premise that the role of school leaders is crucial to successful classroom technology integration. A pilot study conducted for the purpose of informing this study indicated that there was no significant difference between leaderships' and teachers' technology use competence (see chapter three for details). The results of the pilot study indicated fairly significant discrepancies in the beliefs of leadership and teachers in three key areas of leadership for technology use: access and technical support, professional development or training, and support for integration.

The literature pointed out that in order for technology integration to be successful, several areas of need should be addressed by school administration:

1. Provision of general administrative support for teachers (Dwyer, 1995; Ely, 1990a; Hamilton, 1998; Kozma, 2003; Lan, 2001; Pisipia, 1994; Sandholtz et al., 1997).

2. Provision of professional development opportunities to increase knowledge about computers and integration (Dawson & Rakes, 2003; Felder, 2003; Kozma, 2003; Morton, 1999; Pisipia, 1994).
3. Provision of access to appropriate resources (Bridges, 2003; MacNeil & Delafield, 1998; Pisipia, 1994; Russell, 2004).
4. Establishment of a school vision and/or culture for integration (Bridges, 2003; MacNeil & Delafield, 1998; Kozma, 2003; Lan, 2001; Pierson, 2001; Sandholtz et al., 1997).
5. Provision of pressure and incentives for integration (Bridges, 2003; Lan, 2001; Pisipia, 1994; Russell, 2004).

The pilot study indicated that there were discrepancies between the beliefs of school leadership and teachers in the existence of three of these needs. The other two needs listed were not addressed directly in the pilot study but are found in the existing literature in leadership and beliefs about technology use. Based on these findings, the purpose of this mixed methods study is to investigate the beliefs of school leaders and the teachers concerning support factors that affect technology integration. The study was rooted in the theoretical assumptions of the effects of beliefs on educational practices as stated by Pajares (1992).

Theoretical Assumptions

Pajares (1992) made the following fundamental assumptions on the functions of educational beliefs:

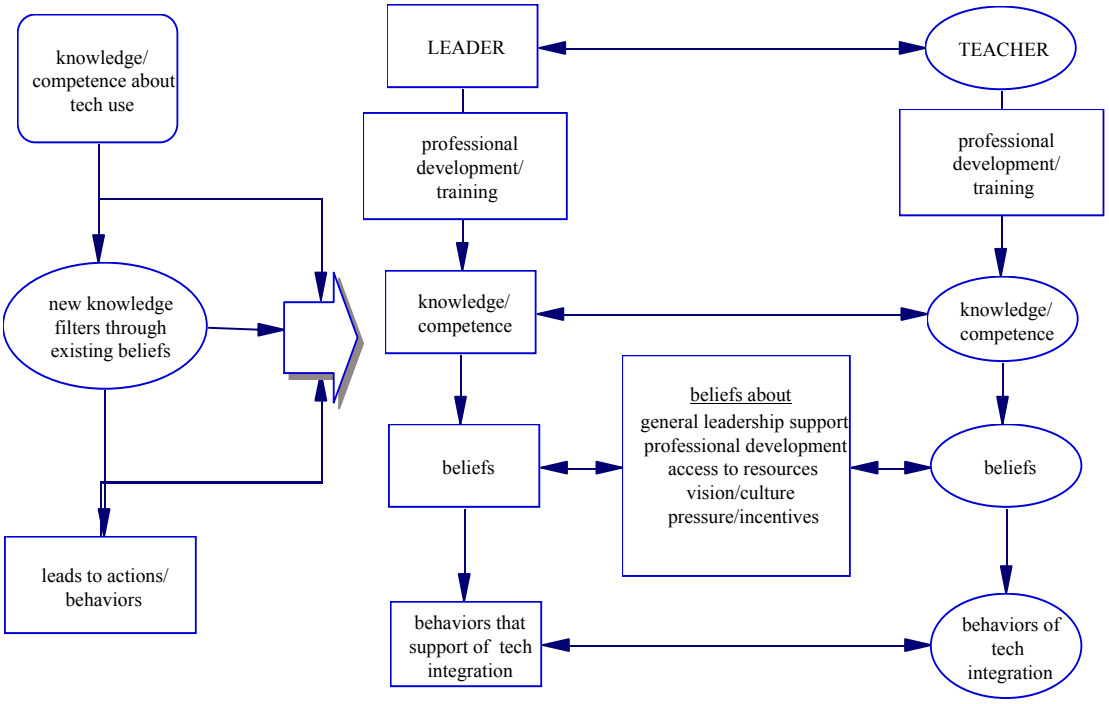
1. Knowledge and beliefs are inextricably intertwined, but the potent affective, evaluative, and episodic nature of beliefs makes them a filter through which new phenomena are interpreted.

2. Epistemological beliefs play a key role in knowledge interpretation and cognitive monitoring.
3. Belief substructures, such as educational beliefs, must be understood in terms of their connections not only to each other but also to other, perhaps more central, beliefs in the system. Psychologists usually refer to these substructures as attitudes and values.
4. Individuals' beliefs strongly affect their behavior.
5. Beliefs must be inferred, and this inference must take into account the congruence among individuals' belief statements, the intentionality to behave in a predisposed manner, and the behavior related to the belief in question (p.325-326).

The A+ Education Reform Act, which included House Bill 1187, was passed in 2000 by the Georgia House of Representatives. This bill required all certified educators to demonstrate instructional technology proficiency through completion of state-approved professional development, coursework, or a competency evaluation by 2006 in order for them to retain their professional educator certificate. Many school leaders and teachers throughout the state have completed this requirement. In the system that this study took place, it is the responsibility of the school leadership to ensure that all certified employees have completed this proficiency by July 2006. Technology integration competency and comprehension received and/or demonstrated via a state-approved method should have a comparable influence on the competence and knowledge of both school leaders and teachers throughout the state. Based on Pajares' (1992) assumptions, this technology integration knowledge would be filtered through the individuals' belief systems and the subsequent instructional behaviors would be a product of that filtering process. However, that comparable knowledge may be filtered through different individual belief systems, including those beliefs about factors affecting technology integration, including general leadership support, professional development received, access to resources, school vision or culture, and/or pressure and incentives. A difference

in the belief systems of leaders and teachers about these factors could affect the behaviors that influence both the leader's support of technology integration and the teacher's practice of technology integration. Figure 1 gives a graphical representation of the proposed pattern of relationships between the leader and teacher knowledge, beliefs and behaviors.

Figure 1. Beliefs to behaviors.



Research Questions

The following questions guide this study:

1. Is there a difference between the school leaderships' beliefs concerning classroom technology integration and the teachers' beliefs about classroom technology integration?
2. If so, what is the essence and nature of those differences?

More specifically, this research seeks to answer the following questions:

1. Is there a difference between the school leadership and the teachers in their beliefs about the types and availability of support factors that affect technology integration?
2. What are school leaders' beliefs about the support role they play in teacher integration of instructional technology?
3. What are teachers' beliefs about the support role that school leadership plays in teacher integration of instructional technology?
4. How do school leaders describe the support they provide for teacher integration of technology in the classroom?
5. How do teachers describe the support they receive from school leaders for their integration of technology in the classroom?

Significance of this Study

The study of beliefs is important to education. Beliefs play a critical role in defining behavior and organizing knowledge and information. People tend to hold on to their beliefs based on incorrect or incomplete knowledge, even after scientifically correct explanations are presented. Pajares (1992) states that "attention to beliefs of current and preservice teachers can inform educational practice in ways that prevailing research agendas have not and cannot" (p. 329).

Learning how beliefs change and how one might influence that change is, in the end, the goal of educational research on beliefs (Rokeach, 1968). Research has been conducted in the areas of importance of technology integration in the classroom (Dwyer, 1995; Plomp & Pelgram, 1991; Sandholtz et al., 1997), the need for effective leadership as teachers move toward integration (Dwyer, 1995; Ely, 1990a; Kozma, 2003; Lan, 2001;

Pisipia, 1994), as well as teacher's beliefs about instructional technology (Fulton & Torrey-Purta, 1999; Leatham, 2002; Loague, 2003). However, research about a relationship between the instructional technology beliefs of school leadership and the instructional technology beliefs of the teachers is sparse at best. This research study sought to add to the body of literature in this area. This additional investigation into beliefs may be of great benefit since knowledge is filtered through one's beliefs (Pajares, 1992), beliefs are a powerful influence in the classroom, and a teacher's personal and educational beliefs affect their choice of whether or not to use technology in the classroom (Honey & Moeller, 1990). Knowledge gained from this study may be used to assist in the development and improvement of school system instructional technology policies and/or in the development of strategies for school leadership to implement in order to increase and improve the use of instructional technology by teachers in their classrooms.

Terms and Definitions

In this research project, the following definitions are implied when these terms are used:

Beliefs: Statements that assume fundamental truths about reality (Olsen, 1991); an individual's judgment of the truth or falsity of a proposition (Pajares, 1992). In this study, those beliefs were derived through data from the survey instrument and interview responses.

Dana®: A hand-held laptop alternative that is combination of a full-size keyboard with a wide screen that can run over 20,000 applications.

Knowledge: The awareness and understanding of facts, truths or information gained in the form of experience or learning as revealed on the survey and interviews in this study.

Instructional Lead Teacher (ILT): A leadership position at the elementary school level in this school system with responsibilities similar to those of an assistant principal, including assisting teachers with instructional questions and concerns.

Instructional Technology Coordinator: A county office level certified leadership position in the division of Curriculum and Instruction. Responsibilities are related to the use of instructional technology in all schools, including but not limited to professional development, software and hardware evaluation and recommendation, and curriculum development.

Instructional Technology Specialist (ITS): A certified teacher position at each school in this system. Responsibilities include providing teacher training, assistance, and support with the use of technology in the classroom, and also troubleshooting technical problems with computer and related equipment.

Intel: A paraprofessional position at each school whose main responsibility is to maintain the school computer server and other hardware, and also assist the ITS as needed.

Leader: The principal is the primary leader in the public school system. Other leaders include the assistant principal and instructional lead teacher.

Role: The characteristic and expected behavior of an individual.

Supporting factors: Factors that aid teachers in technology integration, such as professional development, access to appropriate hardware, software and related resources, school vision or culture, planning time, and incentives.

Technology: Tools that assist in performing tasks more efficiently or with higher quality, including computer-related hardware, software and peripherals (Grabe & Grabe, 2001).

Technology Director: A system level classified leadership position with responsibilities related to the evaluation, procurement and maintenance of system hardware such as servers and all other computer-related hardware, student information system, and Internet connectivity.

Technology Integration: Students are learning about the curriculum content, and the knowledge of hardware and software is secondary. The technology fits seamlessly with the teacher's instructional plans and philosophy and represents an extension of them rather than an addition to them. The student has an active role as a learner and the teacher's role is as a facilitator (Grabe & Grabe, 2001).

Summary

Research indicates that school leadership that reduces or removes first and second order barriers is an imperative piece of the integration puzzle if teachers are to move toward successful classroom technology integration (Dwyer, 1995; Ely, 1990; Hamilton, 1998; Kozma, 2003; Lan, 2001; Pisipia, 1994; Sandholtz et al., 1997). Educational and instructional behaviors of both the school leaders and the teachers are related to their beliefs (Kagan, 1992; Parajes, 1992). The purpose of this study is to investigate the relationship between the beliefs of school leaders and the teachers

concerning support factors that affect technology integration. It is based on the theoretical assumptions concerning educational beliefs as proposed by Pajares (1992) and the concept that the study of beliefs is important to education. Chapter Two outlines the literature related to issues surrounding technology integration in education. It includes research on the integration of technology into the K-12 curriculum, the changes such integration can bring to instruction and student learning, and also barriers to this integration; the importance of school leadership for teachers as they move toward technology integration; and beliefs about teaching practices and use and implementation of technology integration. Chapter Three provides a methodology for conducting the study about relationship between the beliefs of school leaders and the teachers concerning classroom technology integration. Chapter Four reports the data and analysis for the quantitative phase of the study. Chapters Five, Six and Seven present individual and within-case analysis of the qualitative interviews. Chapter Eight presents a cross case analysis of the qualitative data. Chapter Nine discusses the study's results and implications for those at the system and school level, and recommendations for future research.

CHAPTER TWO

REVIEW OF THE LITERATURE

The purpose of this study was to investigate the beliefs of school leaders and the teachers concerning support factors that affect technology integration. This literature review explores research related to issues surrounding technology integration in education. The review of the literature will begin with research on technology integration, including the changes technology integration into the K-12 curriculum can bring to instruction and student learning and the barriers to such integration. The next section explores the need for the support of school leadership for teachers as they move toward technology integration and examines the studies relevant to technology leadership, including the importance of strong leadership following the acquisition of equipment and training of the teaching faculty at a school. The final section explores the literature as it relates to investigating beliefs about teaching practices and use and implementation of technology integration.

Research on Technology Integration

Technology has the ability to assist in the transformation of the educational process. The infusion and integration of technology in classrooms can result in greater use of collaborative learning strategies, thematic teaching, guided inquiry practice, group problem solving, and critical thinking, skills that can help students be more successful learners throughout their education experience (Duhaney & Zemel, 2000). Today's

classroom should no longer have the teacher as the focus at the front of the classroom. Performance based, learner-centered instruction puts both the teacher's and student's focus on knowledge and expert systems. This shift in the paradigm from teacher-centered to student-centered requires a change in people's beliefs which will in turn create different behaviors (Porras &Silvers, 1991). If teachers are to understand how computers can best be used to facilitate learning in their classrooms, they must be appropriately and adequately trained themselves. Many studies of computers in K-12 education state that effective integration of instructional technology requires some kind of change in teacher's practice in order to become a less teacher-centered instructor to a more student-centered facilitator (Fuller, 2000).

Pisapia (1994) composed a research brief that examined the impact of computer technology on teaching roles and styles. The research reported in the brief was extracted from three Metropolitan Educational Research Consortium's (MERC) studies. He found that technology had an effect on the pedagogical practices of teachers. A teacher who used technology consistently became a less teacher-centered instructor and more of a coordinator of learning resources, spent less time as a whole-group instructor and more time working with individual students. The teaching focus moved from lecture to exploration and inquiry, allowing the students to work collaboratively on problem-centered activities while the teacher circulated and guided. Students became participants in an inquiry or discovery-based mode, engaged in more numerous and group-oriented projects, and became more active participants in their learning.

Khalili and Shashaani (1994) conducted a meta-analysis of 36 independent studies that examined the effectiveness of computer applications on students' academic

performance and achievement published between 1988 and 1992. They found that computer instruction was effective for learning and achievement across grade levels, and it was more beneficial to students if the instruction with technology lasted more than three weeks. Different types of computer applications had different effects on students learning and achievement. Their study also revealed that if teachers had more experience with computers, as well as a positive attitude toward computer use, there was an overall improvement in student attitude, interest and performance.

In order to gain a more clear understanding of how recent infusions of technology into schools has affected students, Peck, Cuban, and Kirkpatrick (2002) conducted a year-long investigation into technology use at two high schools in the Silicon Valley area of California. The high schools selected were considered by the researchers to represent an ethnic and economic cross-section of high schools nationwide in terms of number of students, SAT scores, and college attendance rates. However, these schools were atypical to other schools in the area of the high access of technology provided to students by the schools. Data collection included (a) shadowing for a full day 12 students who represented all grade levels and academic subjects, (b) observing 35 randomly selected teachers on randomly chosen days, (c) interviewing 33 students, and (d) conducting surveys that included a segment of the student body and teachers at each school. In this study, the researchers found the students reported little or no use of computers in the majority of their academic classes, and this low usage finding was supported by teacher surveys. The researchers also found that teachers most frequently used technology to support, rather than alter, their existing teacher-centered practices rather than constructivist, computer-based projects. Conversely, students reported home access and

high rates of usage outside of schools, in addition to enthusiasm about computers and other technologies and their importance to their lives. Nonetheless, student experience, enthusiasm, and access to technology had little impact on their school experiences. This supports the concept that it's not enough to provide technology to teachers and students in the schools and classrooms. Strong leadership, vision and support are also necessary to encourage and sustain the changes that technology can have on teaching and learning.

Windschitl and Sahl (2002) completed a two-year multi-case ethnographic study that examined how three middle school teachers learned to use technology in the context of a laptop computer program. The teachers and students in a co-educational private religious school in the American northwest had access to laptop computers both during and outside of school hours for two years. The teachers attended technology workshops with their laptops for a year prior to the program implementation. Three research questions guided this study:

1. How do participants' personal histories and beliefs about learners and learning play out within the institutional culture to influence their technology-related instructional practices?
2. How do teachers construct technology related norms and practices with peers and students through their participation in various activity settings?
3. Does the condition of ubiquitous computing influence teachers' movement toward constructivist pedagogy?

Data collection in the first year included field notes, interviews with teachers and administrators, and focus groups with students. The second year of the study three target

teachers were selected for observation, shadowing and interviews. The qualitative data were analyzed through the use of coding and then comparing and contrasting themes.

Although two of the teachers demonstrated movement toward constructivist pedagogy during the study's time frame, these researchers stated that technology was not the catalyst for teachers' changes. More important were the teacher's belief systems about what was proper and possible in their classrooms. Their findings indicated that the influence of ubiquitous or pervasive technology on instructional decisions was significantly mediated by the teacher's belief systems about what good teaching encompassed within the institutional culture, about the learners in a particular school, and about the role of technology in the lives of students. They recommend that technology vision and use be considered within the context of teachers' beliefs about what effective teaching and meaningful learning is and how technology and information access can implement changes in the traditional classroom roles of teachers and students. These finding are important to consider since the school leadership is a major component of the institutional culture.

Barriers to technology integration

If current and pre-service teachers are to become effective integrators of technology, they will need strategies for recognizing and dealing with the various types of barriers they will encounter. Although the type, order, or number of these barriers cannot necessarily be predicted, the fact that teachers will experience a wide range of barriers is almost guaranteed. In a theoretical article by Ertmer (1999), she classified instructional technology barriers into first and second order barriers. First-order barriers to technology integration are extrinsic to teachers and include lack of access to computers

and software, inadequate technical and administrative support, and insufficient time to plan instruction. The majority of early integration efforts focused on removal of such barriers because they were easy to identify and relatively easy to eliminate if funds were available. It was assumed that once these barriers were removed and adequate resources were available, integration would automatically follow, and many teachers felt their frustration with technology integration would be removed as the first-order barriers were also reduced or eliminated.

However, the reduction or removal of first-order barriers may allow the second-order barriers to come to the surface. Second-order barriers are intrinsic to educators and can be deeply rooted beliefs about teaching, established classroom practices and organization, computer use, assessment requirements, and an unwillingness to change. They are those barriers that interfere with or impede fundamental change and can cause more difficulties than do first-order barriers. These second-order barriers are less concrete and more personal and deeply ingrained, and they may not even be obvious to others or to the individuals themselves, which can make them more difficult to identify and effectively address or remove (Ertmer, 1999).

Many first-order barriers may be removed by providing computer-skills training and acquiring additional resources; however, confronting second-order barriers requires questioning one's belief systems and the institutionalized routines of one's practice. Although second-order barriers may not be easily observed, their presence often can be discovered in the comments teachers make about first-order barriers. In relation to technology integration, this implies that second-order barriers may require basic school culture or vision to be revised regarding what defines content and content coverage, how

to identify learning and engaged time, and how to define teaching behaviors. Although the relationship between first and second order barriers is not yet completely understood, Ertmer (1999) stated that examining teacher frustration about technology integration, their goals for technology use, and their beliefs about the role of technology in the curriculum may help those who work with teachers identify effective strategies for helping teachers address both the visible first-order barriers and the less obvious second-order barriers they face.

In Becker's (1994) study, he identified how exemplary computer-using teachers differed from other more typical teachers. He classified exemplary users based on standards that "suggest a classroom environment in which computers were both prominent in the experience of students and employed in order that students grow intellectually and not merely develop isolated skills (p. 294). Overall, low-level technology uses are usually associated with teacher-centered practices while high-level uses are usually associated with student-centered or more constructivist practices. In addition to finding that the use of computers could change the ways that teachers covered curriculum, he also looked at three types of differences among teachers: (1) differences in the classroom, school environment, and the student body where they worked; (2) differences in the backgrounds and experiences of the teachers; (3) differences in the ways teachers carried out their instructional practices and their beliefs concerning teaching and computer use. Although the focus of the study was to identify specific differences among the characteristics within these categories, it was determined that there was a similarity in the barriers faced by exemplary computer-using teachers and to those barriers faced by more typical teachers. However, the exemplary teachers often identified

or recognized fewer barriers than other teachers, or they had personal beliefs and problem-solving strategies that allowed them to overcome the existing barriers that more typical teachers did not have or use.

Ertmer, Addison, Lane, Ross, and Woods (1999) examined teacher beliefs about the role of technology in the elementary classroom based on the research question: How are the teachers using technology in the classroom and what are their reasons for use and non-use? The concepts of first and second order barriers to integration were included in the study. First-order barriers were extrinsic to teachers and included lack of access to computers and software, insufficient instructional planning time, and inadequate administrative and technical support. Second-order barriers were intrinsic to teachers and included beliefs about teaching, established classroom practices, beliefs about computers, and an unwillingness to change. Survey, interview, and observation data were collected over six weeks from seven primary teachers (grades K-2) in a mid-western urban elementary school. Qualitative methods were used to analyze the data. Results indicated that teacher's beliefs about classroom practices appeared to form their goals for technology use as well as the importance they gave to different barriers. Teachers' beliefs interacted with first-order barriers to either limit or facilitate teacher's technology use, which included the aspect of administrative support. Understanding teachers' technology use goals and their beliefs about teaching and learning could be necessary for leadership to support the second-order changes required for innovation to become practice.

In a later theoretical article written by Ertmer (2005), she continued her exploration and examination of the influence of beliefs on classroom technology integration. She stated that although the assumption was that increased or prolonged

technology use would encourage teachers to change their instruction toward more constructivist practice, that assumption had not been verified by research. To this point in time, few researchers had examined how teachers' pedagogical beliefs influenced their adoption and use of technology. In addition, it was not known if changes in established educational structures such as teachers' disciplinary training, time schedules, self-contained classrooms, and departments would be sufficient to facilitate the fundamental changes needed for teachers to implement technology in constructivist methods. Changes in such structures might give teachers more chances to use student-centered practices, but their intrinsic beliefs about teaching practices might hinder further transformation. Although many teachers currently claim to have constructivist philosophies, studies have shown that in reality they implemented technology in ways that are better described as a mixed approach: Their students engaged in authentic, project-based activities at certain times, but then at other times, their students used technology to practice skills, compete tutorials, and memorize isolated facts, such as with test-preparation materials. Teachers explained this inconsistency by referring to contextual restraints of the system or school, such as curricular mandates or social pressure exerted by administrators, peers, or parents. These comments point to a need for both researchers and practitioners to be cognizant of and to account for the potential influence of those contextual factors when looking at teachers' beliefs or encouraging teacher change.

Additionally, teachers tend to use technology to in manners that are consistent with their existing personal beliefs about instructional and curriculum practices. This means that teachers with teacher-centered beliefs are more likely to use technology to support traditional practices with which they are comfortable than to use it to implement

new and different student-centered activities. As long as the teacher is comfortable with her existing beliefs, a change in those beliefs is not likely to occur. Ertmer (2005) stated findings such as these further emphasized the need for more research on the relationship between teacher pedagogical beliefs and classroom technology integration practices, because without a clear understanding of this relationship, researchers and practitioners may continue to advocate for specific technology integration practices that cannot be supported or facilitated due to educators' underlying fundamental beliefs, and one cannot be changed without considering the other. She concluded that it is "impossible" to overestimate the influence of teachers' beliefs on classroom practices.

Garthwait and Weller (2005) conducted an interpretive case study of two middle school science-math teachers, motivated by this general question: Given ubiquitous computing, how do teachers use computers in constructing curriculum and delivering instruction? In the fall of 2002, more than 17,000 seventh-graders and their teachers in 243 Maine middle schools were given access to laptop computers, a major and ground-breaking initiative labeled the Maine Learning Technology Initiative (MLTI). The researchers used qualitative methods to collect data during the first year of the MLTI in order to examine the facilitators and barriers for teachers in using laptops in the classroom. The methods included semi-structured interviews and classroom observations.

Technical knowledge, time constraints for planning, and imposed technology policies were determined to be the major barriers faced by the teachers. Two different dimensions of the facilitators and barriers for one-to-one computing were found: (a) the effect of technical technological issues, and (b) the educational effect of technology policies. Although school and district policy was not one of the original research

categories, the researchers found important interactions between policy and teaching and learning. For example, during the summer before MLTI, the school at which the study was conducted had the laptop integration team draw up Technology Use Guidelines that outlined decisions concerning when students would be allowed to take the laptops home and get e-mail. These decisions had unexpected negative effects on teaching and learning for these teachers. For both teachers, the response to these three barriers was deeply influenced by the teacher's beliefs about teaching and learning, which in turn affected their ultimate decisions of how their time and their students' time was spent with the computers.

Summary

When teachers fully integrate and implement technology into their classrooms, the traditional role of the teacher is transformed from the center of classroom learning to a facilitator who can guide students down a path of discovery and investigation. Teachers who use technology consistently become less teacher-centered instructors and more a coordinator of learning resources, spending less time as whole-group instructors and more time working with individual students (Pisapia, 1994). Technology helps bring about change and restructuring in classrooms where teaching no longer is centered on the transfer of knowledge from teacher to student; learning comes from student inquiry, critical thinking, and problem solving based on information accessed from a variety of sources. Students become more active and involved in their own learning, and their attitude, interest and performance improve (Khalili & Shashaani, 1994)). Teaching and learning in computer-based classrooms becomes significantly more student-centered and individualized than teaching and learning in traditional classroom settings (Swan &

Mitrani, 1993). The students are often more focused and motivated than in the traditional classroom, displaying increased initiative by going beyond the requirements of an assignment, increasing their time on assignments and projects while using computers, participating in spontaneous peer coaching and cooperative learning, and motivating other students in the class through their own motivation and excitement. There is also more long-term understanding of the material as opposed to the low-level recall of memorized facts (Sandholtz et al., 1994). Technology can be a stimulus for change and personal tool that empowers both the teacher and the learner (Becker, 1994). However, not all research finds technology effective in the classrooms. If the technology that is provided to schools, teachers, and students is not used in an effective, student centered manner or not used at all, no changes will occur in the educational experiences of the teacher or learner (Peck et al., 2002; Windschitl & Sahl, 2002). Extrinsic first-order barriers and intrinsic second-order barriers can prevent teachers from being successful with technology integration. While first-order barriers can be significant obstacles to achieving technology integration, they have been widely addressed through the increase of funding to provide computer equipment and training. However, the relative strength of second-order barriers may override the reduction in first-order barriers (Ertmer et al., 1999; Miller & Olson, 1994). If we are to achieve changes in the second order barriers teachers face, including beliefs, that are needed to transform teaching practices, it is necessary to examine the teachers and their beliefs about teaching, learning and technology (Ertmer, 2005).

Research on Providing Leadership and Support for Teacher Technology Integration

The need of support of school leadership for teachers as they move toward technology integration has been documented in studies focused on factors that affected integration at the instructor level. These studies have pointed out several needs to be addressed by school administration: (a) provision of general administrative support for teachers (Dwyer, 1995; Ely, 1990a; Hamilton, 1998; Kozma, 2003; Lan, 2001; Pisipia, 1994; Sandholtz et al., 1997); (b) provision of professional development opportunities to increase knowledge about computers and integration (Dawson & Rakes, 2003; Felder, 2003; Kozma, 2003; Morton, 1999; Pisipia, 1994); (c) provision of access to appropriate resources (Bridges, 2003; MacNeil & Delafield, 1998; O'Dwyer et al., 2004; Pisipia, 1994); (d) establishment of a school vision and/or culture for integration (Bridges, 2003; Kozma, 2003; Lan, 2001; MacNeil & Delafield, 1998; Pierson, 2001; Sandholtz et al.,1997); and (e) provision of pressure and incentives for integration (Bridges, 2003; Lan, 2001; Pisipia, 1994; O'Dwyer et al.,, 2004). This section of the literature review examines the studies relevant to these areas of technology leadership and the importance of strong school-based leadership following the acquisition of training by the teaching faculty at a school.

General Administrative Support for Teachers

Apple Classrooms of Tomorrow (ACOT), a ten-year-longitudinal study begun in the fall of 1985, investigated the relationship between technology and education (Dwyer, 1995). The ACOT project equipped classrooms with desktop computers for teachers and students, software, printers, and laser disc players. Over a period of ten years, qualitative data from interviews, emails, and observations was gathered from 32 teachers in five

schools located in four different states. In one ACOT research sub-project that addressed teacher change and needs for instruction in a technological environment, Dwyer (1995) identified a series of five stages that teachers went through as they integrated the computer into their practice: (a) entry, (b) adoption, (c) adaptation, (d) appropriation, and (e) invention. This research found that in order to challenge teachers' professional beliefs about practice, teachers needed sustained support. They needed to be engaged in ongoing conversations and reflection about their teaching and how they might change and enhance it with technology. These conversations should include additional support to help the teachers make the changes in how they used computers in their teaching. As support continued, these teachers envisioned what they could change next in their classrooms.

In another report using data gathered from the ACOT research project, Sandholtz, et al. (1997) found that school leadership's support was imperative for determining whether or not teachers integrated technology into their teaching practices. Concerning leadership, they found that by (a) making technology use a priority, administrators reduced barriers to technology integration such as insufficient time for continued learning, limited access, and lack of technical support; (b) showing interest in changes teachers were instituting in their classrooms, administrators offered their teachers much needed emotional and moral support; (c) encouraging teachers to take positions of leadership, administrators increased their likelihood that teachers would share what they had learned with their colleagues; and (d) working with their staff to create a shared vision of the future, administrators eased tensions among teachers and fostered teacher collaboration rather than competition (Sandholtz et al., 1997, p.179-180). The ACOT project was funded for ten years through the Apple Corporation. When the teachers

involved in this project were no longer funded and lost other aspects of support in their classrooms provided by the research project, these teachers had little time to continue learning and developing, and they also found little support for their attempts to share their experiences and knowledge. Their colleagues were not willing to give up their time for the training they were willing to provide. After the ending of the research project, these teachers lost the administrative support needed to continue these projects and incorporate them into the school culture.

Administrators have an obligation to help teachers utilize effective instructional tools, including computer technologies. Using literature from North American studies on educational change on the research and evaluation of technological-change processes in education, Ely (1990a) identified eight conditions that facilitated the adoption, implementation, and institutionalization of instructional technology innovations. These conditions were dissatisfaction with the status quo, knowledge and skills, resources, tune, rewards, participation, commitment, and leadership. Ely evaluated the appropriateness of these conditions to applications involving instructional technology in Southeast Asia (Indonesia) and Latin America (Chile and Peru) to determine the robustness of the concepts in other cultures. Interviews of educational technologists and other educators in these countries were the primary source of the information that helped to confirm these conditions that facilitate implementation of instructional technology. Using a structured interview that included a tentative list of conditions that facilitate the implementation of instructional technology, a minimum of 25 individuals in each country identified as leaders in their field for the past 15 to 25 years responded to questions about the state of instructional technology in their countries. These individuals, their colleagues, and the

literature they identified (reports, evaluations, and other published materials) provided the bulk of the data for the study. Most of the conditions that facilitated change were present in each country (Ely, 1990a). This research validated these eight conditions could be used by any individual involved in the change process in education. These conditions could also be used as a screening tool to identify potential problems, but the researchers could determine the exact causes of these potential problems. Also determined was that cultural and personality variables must also be taken into consideration when using these conditions as part of an analytical tool to judge the presence or lack of presence of each type.

Ely (1990b) suggested that movements to increase technology use should have visible, two-pronged leadership from both a project leader who is involved in the day to day operations and an executive officer of the organization. Even though classroom teachers often act alone, they still need the inspiration and continuous support of individuals whom they respect. These school and system leaders should provide initial encouragement to consider new ideas. They should ensure that the necessary training is received and that the materials needed are easily available. They must be available for consultation when discouragement or failure occurs, and they should continually communicate their enthusiasm for the current effort, such as technology integration.

Isolated classroom teachers do not have the resources nor the power within the school to transform teaching and learning with technologies. Having a committed principal and other leadership support is essential. In a research brief by Pisapia (1994) extracted from the Metropolitan Educational Research Consortium (MERC) technology studies, it was reported that three general factors influenced teachers' decisions to use

technology. These factors were (a) the teacher's knowledge of appropriate uses of the computer technology, (b) incentives that favor or discourage computer use in the classroom, and (c) access to necessary resources and support.

In a study done by Hamilton (1998) on performance discrepancies in the use of instructional technology in a technology-rich high school in Georgia, he found that the higher users and the lower users of technology were not strongly differentiated by their attitudes toward integration. The major force for the majority of the teachers (N=39) seemed to be the concept of leadership and support. A mixed methodology was implemented, with a survey used as the quantitative data, and field notes and interviews used as the qualitative piece. A regression equation identified three variables related to whether teachers were high or low users of instructional technology. The survey results identified as influential were the teacher's computer integration score, the highest degree earned, and subject matter taught by the teacher. Interview and observational data suggested four other variables that may help explain individual variations. These areas are (a) administrative leadership, (b) support structure complexity, (c) teaching style, and (d) attitudes toward teaching and learning.

The study found a relationship between the presence of leadership and the degree to which teachers made use of available technologies. Higher users of technology usually had a more complex support structure involving various levels of leadership. The teachers that had the more complex support structures also had a more positive attitude toward various issues involving the use of technology for classroom instructional purposes. The author states that more research is needed on the influence of leadership

and support structure in schools with available technology since his results showed these aspects to be an important variable.

Fuller (2000) conducted an analysis that applied innovation diffusion theory to data from U.S. public schools (n= 6,085) obtained from Stage II of the *Computers in Education Study* conducted by the International Association for the Evaluation Achievement (IEA). She investigated the effects of the allocation of computer coordinator work time on incidence of student computer use in academic subjects in Grades 5 and 11. She found it could be predicted that teachers who are struggling with the uncertainty about computers and technology would not be likely to integrate computer-based work as part of their teaching. Some causes of uncertainty include the following: (a) technical reliability, or that the computers may "break down" at critical moments in the classroom and the teacher will not know what to do about it; (b) gains in student performance will not justify the investment of time and effort in computer use; and, (c) the potential benefits of computer use is not as important as other needs, i.e. preparing for a test or exam. Her findings suggested that teacher support is more critical to student use than is student support. The effects of this support are different in various grades and subjects, and the effectiveness of technology support for teachers may be contingent on the degree to which the computer coordinator or support person's position is perceived to be similar in status to the position of the teacher being supported (peers supporting peers). Her research identified teacher support as necessary, but did not examine the school leadership as part of the support network, a possible limitation of this study since many schools do not have a full time technology support person on campus.

Bernal (2001) studied the perceptions of teachers, principals, and instructional technology specialists of current levels of technology implementation in elementary schools in a large, urban school system. He also examined the relationship of five leadership factors to the teacher's level of technology implementation: (a) support, (b) involvement of the principal in technology use, (c) encouragement and evaluation of teacher's technology use, (d) presence and use of a plan, and (e) the implementation of curriculum-integrated technology professional development. This was a descriptive study that used quantitative methods (two teacher surveys and a principal survey) to answer five research questions. The questionnaires were derived from the outcomes of the school system's technology proficiencies. The teacher questionnaire also included questions that addressed leadership factors that affected teachers' use of technology adapted from the Profiler version of the SEIR-TEC Technology Integration Gauge. The results in this study indicated that the majority of these schools were performing at the novice level of technology integration. For all leadership factors, there was a significant difference between the ratings of novice level teachers who saw leadership as low and innovator level teachers who saw leadership as high. There was a low level of agreement (19%) between all three stakeholders on current implementation levels, which led the author to determine there was a misalignment of goals for these stakeholders or perhaps a lack of knowledge gained through observation, evaluation, or assessment on the parts of the instructional technology specialists or principals.

The International Society for the Evaluation of Educational Achievement (IEA) authorized a major three-module study to look at technology, innovation and educational change throughout the world. The analysis of 174 case reports generated by these

research teams was used in writing *Technology, innovation, and educational change: A global perspective* (Kozma, 2003). A series of qualitative studies were included that identified and described innovative pedagogical practices that used technology, also referred to as "innovations." Researchers looked at primary and lower and upper secondary classrooms in 28 countries from North America, South America, Europe, Asia, and Africa. National Research Teams used common sets of methods and instruments to collect data and analyze pedagogical practices of teachers and learners as they involved the use of instructional technology, and the factors that both influenced and supported them. The researchers in this study determined that there were certain conditions that were necessary, but not sufficient, for innovations such as instructional technology to be sustained. The essential conditions for sustainability were teacher support, student support, perceived value of the innovation, teacher professional development, and administrative support.

Support of the school administration, principal, or head teacher was an essential factor that contributed to sustainability and growth of the use of instructional technology. The findings suggested that a principal could play a minimal role as a "gatekeeper" and thereby sustain such an innovation by approving of its existence and not undermining or sabotaging it. However, in situations where the school leadership and environments were consistently unsupportive, efforts of the teachers would be slight, short-lived or possibly non-existent. The supportive style of leadership, rather than a passive or neutral role, was more likely to result in sustaining an innovation such as technology over a greater length of time. This happened because supportive leaders were more likely to lessen the burden on the teachers by dealing with the outside issues such as funding, upgrading and support,

allocating time for the teachers to adopt the use, and support training for the teachers. The actively involved leaders were likely to be visionary users of technology who demonstrated their skills in use of technology and cajoled others into adopting their vision. They shared the goals, purposes and principles of the technology use as it would serve to improve teaching and learning with all involved stakeholders in the school (Kozma, 2003).

Technology Integration Knowledge

The infusion and integration of technology into the educational system has created new avenues through which teachers can enrich and enhance teaching and learning experiences. The need for providing teachers with adequate, extensive and relevant training for technology integration has been well documented (Dwyer, 1995; Fuller, 2000; McKenzie, 1991; Morton, 1999; Office of Technology Assistance, 1995; Sandholtz et al., 1994; Scheffler & Logan, 1999; Schuttloffel, 1995; Wenglinsky, 1998). Although training can help teachers overcome their fears and computer illiteracy, training alone may not be sufficient to provide teachers with the knowledge, skills, and motivation they need to successfully integrate computers into the curriculum and their classrooms (McKenzie, 1991). Classroom teachers who are trained to teach and facilitate learning, not design instructional software or repair computers, must be offered timely, consistent and relevant support with the technology they encounter on an on-going basis (Office of Technology Assistance, 1995).

Morton (1999) conducted a qualitative single case study to explore the relationship between teachers' concerns about a technology innovation and the successful implementation of that innovation at a northeastern elementary school. This study

examined the technology support and training provided to elementary school teachers during initial implementation of a technology innovation in the classroom. The results of the study showed that various influences affected the teachers and their concerns during the first year of implementation, including professional development activities, teacher and student computer usage, and the support of administrators and peers. The study indicated that the four most beneficial areas of support for the teachers were technology training, the patience and expertise of the technology support staff, collegial assistance, and administrative encouragement.

Feldner (2003) conducted research based on transformational leadership theory and educational change theory to examine relationships that may reflect the influence school administrators have on teachers' technology integration competencies in North Dakota schools. Data obtained from a U.S. Department of Education Technology Literacy Challenge project was used. The research questions looked at the relationship of school administrators and technology integration competencies of teachers under their leadership in regard to the competency of (a) modeling effective use of technology, (b) leading professional development, (c) leading and managing systemic change, and (d) maintaining a knowledge base of effective practices related to instructional technology. The knowledge base competency showed the highest correlation, followed by modeling and leading professional development, with leading and managing systemic change showing the least and weakest correlation. Results indicated that these specific competencies of school administrators are positive influences on teachers' integration competencies.

The leadership in a school largely determines the outcome of technology integration; however, if the administrators do not fully understand it, they cannot fully or effectively support it. Dawson and Rakes (2003) conducted a quantitative study to investigate whether technology training received by principals influenced the integration of technology into the classroom. The level of technology integration in the schools' curricula was assessed using the School Technology and Readiness (Star) Chart Assessment online data collection survey instrument which collects data on connectivity, hardware, content, professional development, and integration and use. Demographic data was also collected from K-12 principal respondents (N=398). ANOVA test results indicated that principals who received training focused on integrating technology into the curriculum lead schools with higher levels of integration than those receiving any other types of training. Technology training that had been received in the past twelve months and consisted of more than 51 hours of instruction had even a greater influence on integration. This indicates that school leaders' knowledge of technology integration is an important aspect of school-wide classroom integration, as is the teachers' knowledge of technology and integration (Dwyer, 1995; McKenzie, 1991; Morton, 1999; Office of Technology Assistance, 1995; Sandholtz et al., 1997; Scheffler & Logan, 1999; Wenglinsky, 1998).

Access to Appropriate Resources

Vockell and Sweeney (1994) compared two schools and found that the commitment of resources led to substantial improvements in the instructional use of computers at one school while the other school lagged behind. However, there were no significant differences in the teachers' perceptions of what contributed to effective

computer use. At both schools, the teachers rated school-sponsored workshops, self-training, and encouragement and assistance from colleagues very highly, but the school with a significantly higher rate of computer use for instruction had stronger administrative support which provided key resources. These resources included having a full-time instructional technology coordinator, using a start-up grant to pay for training of a core group of teachers, seeking funding from public and private sources, and developing a feeling of pride and professionalism in the teachers.

MacNeil and Delafield (1998) examined principal leadership for successful school technology implementation in a quantitative study conducted in Texas. They surveyed one hundred twelve principals and assistant principals. The majority of the principals saw technology in their schools as important, as well as the teachers' ability to learn and use technology as an instructional tool. The main findings of the study included the following: (a) main barriers to classroom technology integration were poor infrastructure, lack of financial resources, and lack of time for professional development and lesson planning; (b) a closer alignment was needed between the time allotted for professional development and its perceived importance; (c) leadership, training and funding issues should have been addressed simultaneously if technology integration into the curriculum was to grow and have a significant impact on education reform; and (d) principals and school leaders should have created supportive conditions that foster innovative classroom computer use.

School Vision and/or Culture for Integration

Hohensee (1998) analyzed the relationship between middle school teachers' professional use of computers and four factors associated with instructional technology.

These factors were (a) teacher participation in decision making regarding instructional technology, (b) amount of training received by teachers, (c) worksite access to computers by teachers, and (d) age of computers used. This quantitative study used two surveys of teachers in a Georgia middle school for the research data. The survey questionnaire was a modified version of the previously tested Teacher Involvement and Participation Scale (T.I.P.S). A major finding in this study was that administrators should consider including teachers in technological decisions, particularly in budget and participation decisions. Teachers who felt there was opportunity for them to have input into creating a school vision for technology integration by participating in technology decision making and for creating goals for its use were more likely to take initiative to use computer technology.

Lan (2001) conducted a qualitative study on the technological and pedagogical requirements necessary to prepare a group of education faculty for incorporating technology in their practice. To establish the actual practice in schools, colleges, and departments of education, two sets of interviews by e-mail and telephone were conducted. The voluntary participation produced 31 interviewees that represented schools, colleges, and departments of education at 26 universities and colleges. Her findings indicated that the culture of a school or institution provides incentives to individuals' behaviors because it "approves" or "disapproves" of certain behaviors or actions. A school culture perceived by teachers as nurturing technology use and innovation will encourage the use and integration of technology. This type of school culture can be developed by those in administrative and leadership positions through recognizing effort, rewarding success, and fostering a sense of pride in these actions. This study focused on the area of higher education involved in teacher training programs,

including the award-winning Curry School. A deficiency of this study is that it was completed with higher education faculty that trained teachers, but did not continue the research to investigate to see if these same major factors could be of influence of faculty at the K-12 education level.

Pierson (2001) conducted a qualitative case study that investigated how teachers at various levels of technology use and teaching abilities used technology, and how that technology use related to general teaching practice. In particular, the researcher looked at the role teachers perceived for themselves and their students for computer technology in their classrooms, including the ways they planned for computer use, the routines they established to facilitate and manage the use of computers in instruction, strategies they used to teach with and about computers, and the methods used to assess learning. Conducting a case study with three teachers, she found that technology integration had different connotations for each of the individual teachers. She proposed that technology integration be locally defined as part of the school vision in a manner understood by all stakeholders so integration can be planned for, implemented, assessed, and generally understood. Rather than focusing mainly on technology purchases and providing basic computer use training, strong educational leadership was needed to lead efforts and create a school culture that is conducive to continued growth in pedagogy and appropriate teaching strategies as well as in technology use.

Pressure and Incentives for Integration

Bridges (2003) investigated the actions and beliefs of principals identified as instructional leaders in technology, the perceptions of teachers regarding the principal's role in technology leadership, and how the technology plan articulated and laid the

framework for the technology vision at the research site. Three middle schools in San Diego County, California were used in this study. Bridges conducted a qualitative study which included the following methods: (a) in-depth interviews conducted for the researcher to collect first hand accounts of the principals' experiences with technology integration and what they perceived to be the role they played in technology at their school site, (b) focus groups held with teachers aimed at determining how the vision and principal leadership influenced their pedagogy, and (c) pertinent technology documents collected and analyzed, and classroom observations conducted to determine if the vision and goals on paper matched the classroom practices. Three key findings related to the principal's role in technology integration were that principals must (a) hold high expectations, (b) foster teacher buy in, and (c) be resourceful.

O'Dwyer, Russell, and Bebell (2004) reported on a three-year, $1.7 million study funded by the Office of Educational Research and Improvement. The study employed several methodologies that included the following: (a) surveys of 120 district-level leaders, 122 principals, 4,400 teachers, and 14,200 students in 22 Massachusetts school districts; (b) interviews with over 200 district and school-level leaders; (c) case studies that included a combination of classroom observations, student and teacher interviews, and additional student and teacher surveys; and (d) an examination of the relationship between technology use and student achievement via the measurement of student learning, including grades and test scores. Data from the Use, Support and Effect of Instructional Technology (USEIT) study were analyzed that centered on identifying teacher, school and district characteristics associated with teachers' use of technology. This data was used to identify and examine potentially alterable variables at the teacher,

classroom, school, or district level that could positively affect teachers' sustained use and integration of technology into their teaching practices. The strongest predictors of school-to-school differences among teachers' use of technology for delivering instruction were perceived pressure to use technology and, not surprisingly, the availability of technology. Teachers' perceived pressure by school leadership to use technology was positively associated with technology use. When teachers in the school felt pressure to use technology, they were more likely to use technology to deliver instruction, to have their students use technology during class time and to create products using technology, and to a lesser degree, use technology for class preparation. The study also showed that the socioeconomic status of the school was only a weak predictor of the differences in use among schools, and poor professional development was shown to impede teachers' use of technology for delivering instruction.

Summary

To convince and motivate a school faculty to discard traditional methods of instruction and welcome new techniques is not an easy task. The main force for the majority of the teachers seemed to be the concept of leadership and support (Hamilton, 1998). Sustainability and growth of the use of instructional technology required the support of the school administration (Kozma, 2003). Emotional, moral, and material support reduced barriers that could prevent teachers from challenging their professional beliefs about practice (Dwyer, 1995). Teachers that have more complex support structures also had a more positive attitude toward various issues involving the use of technology for classroom instructional purposes (Hamilton, 1998).

Support included ensuring the necessary training is received and that the materials needed are easily available (Ely, 1990b). There was a significantly higher rate of computer use for instruction where there was stronger administrative support that provided key resources (Vockell et al., 1994). In environments where the school leadership and environments were consistently unsupportive, efforts of the teachers would be slight, short-lived or possibly non-existent (Kozma, 2003).

Leadership, training and funding issues must be addressed simultaneously (MacNeil & Delafield, 1998). Leading professional development and maintaining a knowledge base of effective practices related to instructional technology was imperative (Feldner, 2003).

Strong educational leadership was needed to lead efforts and create a school culture that is conducive to continued growth in pedagogy and appropriate teaching strategies as well as in technology use. A school culture perceived by teachers as nurturing technology use and innovation could encourage the use and integration of technology. This type of school culture could be developed by those in administrative and leadership positions through recognizing effort, rewarding success, and fostering a sense of pride in these actions (Lan, 2001). It was also necessary to create a shared vision of the future between leaders and teachers (Sandholtz et al., 1997). The strongest predictors of school-to-school differences among teachers' use of technology for delivering instruction were perceived pressure by the leadership to use technology and availability of technology (O'Dwyer et al., 2004). Principals must hold high expectations and principals must foster teacher buy in (Bridges, 2003). Overall, the research seems to be clear on one aspect - support for technology integration requires action, not just thought.

Research on Beliefs in the Field of Education

In his article on the difficulties of researching the role of teacher beliefs, Frank Pajares (1992) stated:

> …Defining beliefs is at best a game of player's choice. They travel in disguise and often under alias—attitudes, values, judgments, axioms, opinions, ideology, perceptions, conceptions, conceptual systems, preconceptions, dispositions, implicit theories, explicit theories, personal theories, internal mental processes, action strategies, rules of practice, practical principles, perspectives, repertories of understanding, and social strategy, to name but a few that can be found in the literature. (p.309)

Fullan (1982, 1991) stated that no real change will occur in schools without substantial change in practice, including (a) new and revised materials, (b) new teaching approaches, and (c) the possible alterations of beliefs such as pedagogical assumption and theories underlying particular new practices or programs. Since the primary goal of research on beliefs is to describe how the beliefs individuals hold influence and are influenced by one's actions (Kagan, 1992), this section of the literature review will explore research as it relates to investigating beliefs about teaching practices and use and implementation of technology integration.

Research on Teacher Beliefs

Pajares (1992) conducted a meta-analysis of the literature on teachers' beliefs and education research. He argued that teachers' beliefs can and should become an important focus of educational inquiry. He stated that "beliefs are the best indicators of the decisions individuals make throughout their lives" and the beliefs teachers hold "influence their perceptions and judgments, which, in turn, affect their behavior in the classroom…" (p. 307). Through synthesis of his findings on beliefs, Pajares offered

sixteen fundamental assumptions that may reasonably be made when initiating a study of teachers' educational beliefs:

1. Beliefs are formed early and tend to self-perpetuate, persevering even against contradictions caused by reason, time, schooling or experience.
2. Individuals develop a belief system that houses all the beliefs acquired though the process of cultural transmission.
3. The belief system has an adaptive function in helping individuals define and understand the world and themselves.
4. Knowledge and beliefs are inextricably intertwined, but the potent affective, evaluative, and episodic nature of beliefs makes them a filter through which new phenomena are interpreted.
5. Thought processes may well be precursors to and creators of belief, but the filtering effect of belief structures ultimately screens, redefines, distorts, or reshapes subsequent thinking and information processing.
6. Epistemological beliefs play a key role in knowledge interpretation and cognitive monitoring.
7. Beliefs are prioritized according to their connections not only to each other but to other, perhaps more central, beliefs in the system.
8. Belief substructures, such as educational beliefs, must be understood in terms of their connections not only to each other but also to other, perhaps more central, beliefs in the system. Psychologists usually refer to these substructures as attitudes and values.
9. By their very nature, some beliefs are more incontrovertible than others.
10. The earlier a belief is incorporated into the belief structure, the more difficult it is to alter.
11. Belief change in adulthood is a relatively rare phenomenon, the most common cause being a conversion from one authority to another or a gestalt shift. Individuals tend to hold on to beliefs based on incorrect or incomplete knowledge, even after scientifically correct explanations are presented to them.
12. Beliefs are instrumental in defining tasks and selecting the cognitive tools with which to interpret, plan, and make decisions regarding such tasks; hence, they play a critical role in defining behavior and organizing knowledge and information.
13. Beliefs strongly influence perception, but they can be an unreliable guide to the nature of reality.
14. Individuals' beliefs strongly affect their behavior.
15. Beliefs must be inferred, and this inference must take into account the congruence among individuals' belief statements, the intentionality to behave in a predisposed manner, and the behavior related to the belief in question.
16. Beliefs about teaching are well established by the time a student gets to college. (p. 326)

Pajares (1992) stated that the study of beliefs is important to education because the more that is read on teacher beliefs research, the more strongly it appears that this mix of personal knowledge is at the heart of teaching. Beliefs play a critical role in defining behavior and organizing knowledge and information, and people tend to hold on to their beliefs based on incorrect or incomplete knowledge, even after scientifically correct explanations are presented. Pajares (1992) also stated that "attention to beliefs of current and preservice teachers can inform educational practice in ways that prevailing research agendas have not and cannot" (p. 329).

Kagan (1992) examined research on teacher beliefs and discussed the implications this research has for the nature of teaching and teacher education. She centered her findings on two fundamental assumptions based on the research available. The first assumption was most of a teacher's professional knowledge could be regarded more accurately as belief since knowledge is generally regarded as belief that has been affirmed as true on the basis of objective proof or consensus of opinion. In order for a teacher to use the knowledge bases that underlie teaching, he or she must choose among equally valid alternatives, often using personal judgments. The second assumption was that these judgments are based in a teacher's knowledge of the profession and are situated in three ways: (a) in content or the academic material to be taught, (b) in context, or with the particular group or groups of students, (c) and in person, or embedded in the teacher's unique belief system. According to Kagan (1992), an important area for study was the nature of instructional leadership in a school needed to encourage teachers to merge their subjective belief systems and begin to function as a common technical culture and not as different, competing belief systems practiced in isolation. As teachers become more

certain and supported in their practices, they should merge belief systems to define the legitimate goals and processes of classroom instruction. This has great implications for technology integration since appropriate use requires a shift in the varied pedagogical beliefs of many teachers and administrators.

Ford (1992) theorized that goals and personal agency beliefs created motivation. Goals were "thoughts about desired states or outcomes that one would like to achieve" (p.248). Personal agency beliefs consisted of capability and context beliefs. Context beliefs were people's beliefs about people or external factors that could affect achievement of a goal. Capability beliefs were a person's belief about their ability to reach a goal. The combination of these beliefs played a crucial role in determining an individual's motivation to reach challenging but attainable goals. In relation to technology integration in schools, environmental context beliefs would include things such as administrators, teachers, students, parents, buildings, equipment, and professional development. Based on Ford's theory, this environment or context would influence teachers' integration behaviors.

Beliefs and Technology Use and Integration

Using data from the ACOT study, Dwyer, Ringstaff and Sandholtz (1991) determined that teachers who had regular access to computer technology over several years' time experienced significant changes in their instruction, but not until they confronted deeply held beliefs about teaching and learning. Teachers' beliefs were ingrained in the traditional classrooms where they had spent years as a student and then as a teacher. They found that the more things changed, the more teachers needed to face their beliefs about their instructional activity and their beliefs about schooling. This

transformation could be difficult because both contextual and personal beliefs could inhibit progress even when change goals were clearly articulated. They also found two conditions essential for this change were (a) teachers must have an opportunity to reflect on their own beliefs about instruction and learning and develop a sense of the consequences of alternative belief systems, and (b) administrators must be willing to implement programmatic or structural shifts in the environment for the teachers who are evolving instructionally, and provide continued assurance that their struggle is worthwhile.

Fulton and Torney-Purta (1999) investigated how teacher pedagogical beliefs shaped their uses of technology in classroom activities. They conducted a case study that involved five teachers selected from a group of 36 who participated in the fifth year of a Technology Innovation Challenge Grant Program funded by the U.S. Department of Education, the Maryland Electronic Learning Community (MELC). Overall, the teachers used technology to support the kinds of teaching practices they believed to be appropriate, though by the fifth year even the most traditional teachers had moved to slightly less teacher-centered activities. The authors suggested that the results of the study could be explained by a variation of the Theory of Technology Belief Change where computers encouraged changes in classroom practices that also caused change in the teacher's pedagogical beliefs as they used technology. This moved the teacher to more constructivist teaching approaches even if they had not subscribed to them previously. However, it was not just the technology, but the overall learning community and support created by the MELC project that brought about change in practice and possibly evolved into belief structure. Major factors mentioned by the teachers as they moved their beliefs

into practice were related to the support they did or did not receive from their school and the project. The teachers from schools that had more administrative support of innovation and technology use and were provided full time technology support personnel who were active in the project were more successful in moved toward a more constructivist belief system with technology integration.

The importance of motivational beliefs, administrative support policies, and faculty perception of that support on community college faculty use of computers for instruction was examined in a study by Dusick (1999). The study included faculty and administration of seven California community colleges that completed surveys using self-reported questionnaires. The findings of the study indicated that faculty perception of task self-concept, belief in the value of computers for instruction, computer competence, and administrative support were separate constructs which were correlated. One important finding of this study was that task self-concept (anxiety and confidence) did not directly influence a teacher's decision to use computers. More important were the beliefs that computers are beneficial for both the student and the teacher, and the teacher's level of competence mediated the effects of self-concept on use. In addition, motivational beliefs and the perception of administrative support mediated administrative efforts to influence teachers' use of computers.

Wang (2002) investigated preservice teachers' perceptions of the teacher's role in classrooms with computers. The sample for the survey study was 78 preservice teachers beginning their student teaching for a public university in a territory of the United States in the Pacific Rim. Wang based the study on the thesis that preservice teachers' beliefs and perceptions played a significant role in determining their future teaching behaviors.

The questions looked at preservice teachers' perceptions of the teacher's role in classroom with computers, preservice teachers' choices of computer uses when placed in the classroom with computers, and if the preservice teachers' perceptions of the teacher's role in classrooms differed from their choice of computer uses in the classroom during student teaching. The perceptions were measured as teacher-centeredness versus student-centeredness. The study found no significant difference between preservice teachers' perceptions of teacher-centered roles and their perceptions of student-centered roles in classroom with computers, with the preservice teachers perceiving they would likely engage in teacher and student-centered activities equally. However, when tested on their choice of teacher or student-centered computer use, results indicated that preservice teachers would more likely use the computer as a teacher-centered tool. The results indicated that preservice teachers held naïve conceptions of how the computer can be used to enhance teaching and learning, probably because few have experienced classroom environments with the teacher as a facilitator and learning partner. The same could be said for current classroom teachers since many beliefs about teaching and learning are results of personal experience as students.

Leatham (2002) defined beliefs as "dispositions to act" (p. 6) and investigated preservice secondary mathematics teachers' beliefs about teaching mathematics with technology, the experiences in which those beliefs were grounded, and how those beliefs were held. Also investigated was the relationship between preservice teachers' beliefs about teaching math with technology and their beliefs about math, teaching and learning. This qualitative study included four preservice teachers who were selected and studied using classroom observations, emails, interviews and secondary data collection. The

results of the study found the primary dimensions of these preservice teachers' core beliefs about the nature of technology in the classroom related to the availability of technology, the purposeful use of technology, and the importance of teacher knowledge of technology. The preservice teachers envisioned technology having a role in their future classrooms, including being a student motivator, enhancing procedural activities, and exploring concepts. Unfortunately, this study only looked at the preservice teachers who had not yet begun teaching, and no follow up is available to see if the beliefs and actions of these individuals remained the same when they began teaching in their own classrooms.

Loague (2003) conducted a qualitative multi-case study that examined the influence of technology beliefs and practices of higher educational faculty on instructional practices. She investigated how technology influenced instructional practices of higher educational faculty and how beliefs and practices of the institution influenced technology use. The results of this study were that there was no clear indication technology influenced instructional practices, and school culture was the key to integrating technology into instruction. Data indicated that the necessary elements for technology integration, including institutional vision, administrative leadership, technology access and appropriate incentives, were not sufficiently available to support classroom technology integration in this study's setting. None of these participants thought that technology had dramatically influenced or changed their beliefs about teaching and learning or their teaching style. The study did not provide sufficient information to determine if technology use contributed to a change in teaching beliefs or factors that may contribute to such a change if it did occur. Results did support the

findings of other studies that found teachers who incorporated technology into their instruction attributed the change to increased reflection on their teaching, professional development, school culture and administrative expectations (Fulton, 1999).

Lumpe and Chambers (2001) conducted research in order to develop an instrument to assess teachers' context beliefs about using technology in the classroom. The resulting survey was named *Beliefs about Technology and Teaching (BATT*) (Appendix A). This study focused on teacher attitudes and behaviors that influenced technology integration success with a target goal of effective use of technology in the classroom in an engaged learning environment. Development of the survey content was based on Ford's (1992) Motivation Systems Theory and Bandura's (1997) research on self-efficacy. Self-efficacy referred to a teacher's generalized expectancy concerning the teacher's beliefs concerning his or her own ability to perform certain professional tasks as well as the ability to influence students.

The first group of participants in this study (n=20) were teachers participating in technology-related graduate studies. They were used to develop instrument items and establish content validity. The second group (n=307) were teachers participating in a large-scale technology professional development program, and this group was used to test the instrument items. These participants were educators in rural or small-city school districts in the Midwestern United States, with the makeup of 78% female, 59.5% with bachelor's degrees, and an average teaching experience of 14.8 years. Initial findings from the study indicated that the BATT appeared to be a valid and reliable instrument for measuring teachers' context beliefs about teaching with technology. Teachers' context and self-efficacy beliefs were significant predictors of teachers' reported use of

technology-related engaged learning practices. The researchers concluded that assessment of teachers' beliefs as related to technology integration was important because teachers' belief patterns could be used as an effective needs assessment and program evaluation tool. Also, if as theorized, beliefs do lead to action, those involved in school technology efforts need to assess and address these beliefs.

Research on Beliefs in Related Fields

In 1994, Hebert and Benbasat conducted a field study using questionnaires and interviews to measure three factors that could influence the adoption of computer technology in a health care setting: (a) attitudes toward using technology, (b) subjective norms or beliefs about others' expectations, and (c) perceived voluntariness. The data were collected from a convenience sample of registered nurses employed at a Canadian regional hospital. Three attitude or belief factors were strong predictors of behavioral intent. They were compatibility, relative advantage and result demonstrability. One subjective norm factor, the director of nursing, was a strong indicator or behavioral intent. These results indicated that certain beliefs related to attitude and subjective norms influenced behavior. The authors also stated that hospital administrators could increase implementation success by understanding the beliefs behind the behavior that needed to be changed. Since these are social forces very similar to those found in schools, it may be possible to imply similar belief factors affect technology use in the classroom setting.

Information technology is a field closely related to instructional technology since both center around the use of computer technologies. Bhattacherjee and Premkumar (2004) conducted a longitudinal study using both quantitative and qualitative survey data designed to understand changes in belief and attitude toward information technology

usage since these constructs are key perceptions driving information technology usage. They based their research on expectation-disconfirmation theory and information technology usage literature, and the concept that beliefs or attitudes would have a corresponding impact on users' behavior and intent to continue use of information technology. The two-step study involved undergraduate student computer-based training software usage and Rapid Application Development tool usage. Their findings were that information technology users' beliefs about information technology's usefulness and their attitude perceptions tended to fluctuate with time across both technological and usage contexts, and that such change tended to be more prevalent during the early phases of technology use than in the later phases. Results also confirmed the role of disconfirmation (dissonance between users' original expectations and the observed performance) and satisfaction in driving usefulness and belief change. This also supported the theory that individuals' beliefs affect their behavior and belief change in adulthood is a relatively difficult (Pajares, 1992).

Because of the role beliefs play in teaching and learning, educators need to consider ways to assess beliefs and belief change. Ambrose, Clement, Philipp, and Chauvot (2004) created a qualitative survey in an effort to assess prospective elementary school teachers' beliefs about mathematics and mathematics learning. Their computer-based survey, used with more than 150 participants, captured qualitative data that was later quantified using the research rubric they also created. The design of the beliefs survey and rubric was guided by four features of beliefs: (a) beliefs tend to relate to specific contexts, (b) people hold beliefs with different intensities, with some beliefs being stronger than others; (c) beliefs shape interpretations; and (d) beliefs predispose

people toward particular actions. The results from a pre/post administration of the survey demonstrated their survey was an effective tool for assessing belief change concerning seven specific beliefs about elementary school teaching contexts. Participants in semester-long pilot studies completed the instrument in order to establish the validity of the instrument. One group of 15 students was interviewed after completing the survey to determine whether their answers on the computer survey were similar to their spoken answers. The interview and computer responses did not differ significantly, and further probing did not reveal evidence that contradicted their conclusions from analyzing participants' survey responses. Additional class discussions, written work, and additional interviews found that the students' beliefs-instrument scores were consistent with beliefs assessments. This study focused on elementary preservice math teachers, not technology per se. However, because it may be assumed that personal judgments to use particular teaching strategies are based in a teacher's knowledge and are situated in the content or academic material to be taught, in the context of the particular group or groups of students, or embedded in the teacher's unique belief system (Kagan, 1992), looking at teachers instructional technology and integration beliefs could be an informative investigation to conduct.

Summary

Teachers' beliefs can and should become an important focus of educational inquiry because it appears that this mix of personal knowledge is at the heart of teaching (Pajares, 1992). Another important area for study is the nature of instructional leadership in a school needed to encourage and support teachers to merge their subjective belief

systems and begin to define the legitimate goals and processes of classroom instruction (Kagan, 1992).

Context and capability beliefs played a crucial role in determining an individual's motivation to reach challenging but attainable goals (Ford, 1992). This transformation could be difficult because both contextual and personal beliefs could inhibit progress even when change goals are clearly articulated (Dwyer et al., 1991). Teacher's beliefs about classroom practices appeared to form their goals for technology use as well as the importance they gave to different barriers that could inhibit integration. These beliefs interacted with barriers to either limit or facilitate teacher's technology use, and understanding teachers' technology use goals and their beliefs about teaching and learning could be necessary for school leadership to support the changes required for innovation to become practice (Ertmer et al., 1999).

Major factors mentioned by teachers as they moved their altered pedagogical beliefs into practice were related to the support they did or did not receive from their schools. The teachers that had more administrative support of innovation and technology use were more successful in moving toward a more constructivist belief system with technology integration (Fulton & Torney-Purta, 1999). Technology itself may not dramatically influence or change teacher beliefs about teaching and learning, but it appeared that many who changed their teaching style attributed the change to increased reflection on their teaching, professional development, school culture and administrative expectations (Fulton & Torney-Purta, 1999). Also important was the belief that computers were beneficial for both the student and the teacher. In addition, motivational

beliefs and the perception of administrative support mediated administrative efforts to influence teachers' use of computers (Dusick, 1999).

The study and assessment of teachers' beliefs as related to technology integration was important so teachers' belief patterns may be used as a needs assessment and program evaluation tool (Lumpe & Chambers, 2001). This was also important because individuals' beliefs can affect their behavior and belief change in adulthood is a relatively difficult (Pajares, 1992). Although research has suggested that one's beliefs has a strong influence on one's actions (Ford, 1992; Kagan, 1992; Pajares, 1992), a review of the related literature on technology leadership and on beliefs about technology integration revealed that research in the area of school leadership's beliefs about the importance of integration is practically non-existent, as is research about the leadership's technology beliefs and its relationship to those same beliefs in teachers.

Summary of the Related Literature

> "The knowledge, beliefs, and attitudes that teachers have…shape what they choose to do in their classrooms and explain the core of instructional practices that have endured over time" (Cuban, 1993, p. 256).

Real changes in education are slow to occur when technology is used simply to automate traditional models of teaching and learning (Cuban, 2001). A connection between school leadership and teacher technology use is indicated by the literature. Research on the importance of support of school leadership for teachers as they moved toward technology integration has demonstrated the need for (a) provision of general administrative support for teachers, (b) provision of professional development opportunities to increase knowledge about computers and integration, (c) provision of access to appropriate

resources, (d) establishment of a school vision and/or culture for integration; and (e) provision of pressure and incentives for integration. The research on beliefs as related to instruction, pedagogy and technology use and integration also refers to the same general categories of (a) provision of general administrative support for teachers (Dusick, 1999; Dwyer et al., 1991; Fulton & Torrey-Purta, 1999; Ertmer et al., 1999); (b) provision of professional development opportunities to increase knowledge about computers and integration (Dusick, 1999; Leatham, 2002); (c) provision of access to appropriate resources (Loague, 2003); (d) establishment of a school vision and/or culture for integration (Fulton & Torrey-Purta, 1999; Loague, 2003); and (e) provision of pressure and incentives for integration (Loague, 2003). Thus, there appears to be an intersection of needs of leadership for technology use and integration and influences of beliefs on that same technology use and integration.

Learning how beliefs change and how one might influence that change is, in the end, the goal of educational research on beliefs (Rokeach, 1968). Research has been done in the areas of importance of technology integration in the classroom (Dwyer, 1995; Plomp & Pelgram, 1991; Sandholtz et al., 1997), the need for effective leadership as teachers move toward integration (Dwyer, 1995; Ely, 1990a; Kozma, 2003; Lan, 2001; Pisipia, 1994), as well as teacher's beliefs about instructional technology (Fulton & Torrey-Purta, 1999; Leatham, 2002; Loague, 2003). However, research about a relationship between the beliefs of school leaders and the teachers concerning support factors that affect technology integration is limited. This is an area that further investigation may be of benefit since beliefs are a powerful influence in the classroom, and a teacher's personal

and educational beliefs affect their choice of whether or not to use technology in the classroom (Honey & Moeller, 1990).

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

This study was based on the premise that the role of school leaders is crucial to successful classroom technology integration. The purpose of this mixed methods study was to investigate the beliefs of school leaders and the teachers concerning support factors that affect technology integration. The study was rooted in the theoretical assumptions espoused by Pajares (1992) concerning the effects of beliefs on educational practices as presented in Chapter 1.

The literature (Dwyer, 1995; Ely, 1990a; Hamilton, 1998; Kozma, 2003; Lan, 2001; Pisipia, 1994; Sandholtz, Dwyer & Ringstaff, 1997) suggested that in order for technology integration to be successful, several areas of need should be addressed by school administration:

1. Provision of general administrative support for teachers.
2. Provision of professional development opportunities to increase knowledge about computers and integration.
3. Provision of access to appropriate resources.
4. Establishment of a school vision and/or culture for integration.
5. Provision of pressure and incentives for integration.

The review of the literature also revealed that research about the beliefs of school leaders and the teachers concerning support factors that affect technology integration was sparse at best.

A pilot study indicated that there were fairly significant discrepancies between the beliefs of school leadership and teachers in three key areas of leadership for technology use as indicated by the literature: access to appropriate resources and technical support, knowledge about computers and integration received through professional development or training, and general administrative support for integration.

This study used a two-phase, sequential explanatory mixed-methods approach to obtain statistical, quantitative results on beliefs concerning support factors that affect technology integration using a survey with a sample population, and then followed the survey with individual interviews of key informants to explore those results in more depth.

This chapter details the chosen methodology by discussing (a) the pilot study, (b) the population and participation, (c) researcher's role and bias, (d) quantitative data collection method, (e) qualitative data collection methods, (f) data analysis methods, and (g) trustworthiness.

Choosing the Method

A mixed-methods approach addresses pragmatic knowledge claims and may sequentially collect both quantitative and qualitative data in order to capture the best of both quantitative and qualitative approaches. The researcher bases this type inquiry on the assumption that collecting diverse types of data best provides an understanding of a research problem. The mixed-methods sequential explanatory research design consists of

two phases, quantitative followed by qualitative (Creswell, 2003). In this design, quantitative data are collected and analyzed first. When this analysis is completed, qualitative data are collected and analyzed and are used to help explain or elaborate on the quantitative results obtained in the first phase. The second qualitative phase builds on the first quantitative phase and the two phases are connected. The rationale for this type of approach is that the analysis of the quantitative data provides a general understanding of the research problem, and then the qualitative data analysis refines and explains those statistical results by exploring participants' views in more depth (Creswell and Plano-Clark, 2007).

In the first phase of this mixed-methods study, quantitative survey research was used to investigate the school leaderships' beliefs and the teachers' beliefs concerning support factors that affect technology integration. (This survey is discussed in the Instrument section of this chapter – see Appendix A). This survey was used in the first phase of a two-step data collection process in order to determine if there was a difference in the beliefs about technology integration between school leaders and teachers and also inform the selection of the three extreme cases used for the qualitative section of the study (Greene, Caracelli, & Graham, 1989; Yin, 2003). In the second phase, qualitative interviews with one school leader and two teachers at each of the three identified extreme case schools were used to probe and explain any identified differences between leaders and teachers by examining aspects of the beliefs about teaching with technology (Creswell, 2003; Tashakkori, 1998). Other sources of data were gathered from applicable artifacts, such as lab usage reports and results of self-report surveys of level of

technology integration. This study was designed so the mixed methods could provide a richer data source and add scope, breadth and validity to the study (Creswell, 2003).

The qualitative portion of this study was a case study. A case study is 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, permitting uses of multiple sources of evidence by the researcher. A case study may be used to explore situations where no clear, single set of outcomes has been established (Yin, 2003). The defining quality of the case study is that it focuses on the case itself as the unit of analysis, not the research topic, and it has specific boundaries and limits based on time and space (Merriam, 1998; Yin, 2003). The case study relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and benefits from the prior development of theoretical propositions to guide data collection and analysis (Yin, 2003). The use of multiple sources of evidence in case studies allows a researcher to address a broader range of issues. Any finding or conclusion in a study is likely to be more convincing and accurate if it is based on several different sources of information (Yin, 2003).

Case studies are preferred when examining contemporary events in which the relative behaviors cannot be manipulated. Case studies are advantageous when the study is asking why or how questions about a contemporary set of events over which the investigator has little or no control (Yin, 2003). The case study is a means for gaining understanding of and meaning for a phenomenon (Merriam, 1998). Although case studies generally do not predict future behavior, results have proven to be effective for informing policy. Holistic, rich descriptions of real-life situations described by the participants'

experiences help others to understand the impact of and gain insight about a particular phenomenon. In this study, the researcher sought to discover if there were any differences between the beliefs of school leaders and the teachers concerning classroom technology integration, especially as related to support factors. The researcher also will use the results of this study to make suggestions for future system policies concerning additional or new instructional technology professional development requirements and classroom use of technology.

A pilot study for this dissertation was conducted in the summer and fall of 2004. The purpose of the pilot study was to try to determine if school leaderships' technology competencies and beliefs had an influence on school faculty's technology use competence and beliefs in a public school environment. Data was obtained via quantitative surveys. The participants included four principals, two assistant principals, and two instructional lead teachers for the leadership group. The teacher group consisted of four Instructional Technology Specialists and eight classroom teachers.

There were no identifiable differences found for the overall basic technology competencies when compared between the school leadership and the teachers. There was a small level of significance found in three of the seven categories of questions on the survey relating to the relationship between the school leaderships' beliefs in the importance of technology use in classroom instruction and the teachers' beliefs in the importance of technology use in classroom instruction. Table 1 gives details of the statistical results in the three categories.

Table 1

Differences between school leaderships' beliefs and teachers' beliefs

	Leaders N=8 P (alpha) =.1		Teachers N=12 P (alpha) = .1			
Question Category	M	SD	M	SD	Diff in the M	significance
Access to and support of technology	4.91	.235	4.12	.806	.79	.013
Training for the use of technology	4.87	.248	3.91	.802	.96	.004
Leadership and support of technology use	3.72	.78	2.95	1.03	.77	.078

A summary of the findings include the following:

1. The school leadership believed that access and support of technology was stronger at the school and classroom level than did the teachers.
2. The school leadership believed that the training offered and the ability to use technology due to that training was better and more relevant than did the teachers.
3. The school leadership believed that there was more support for the integration of technology at school and classroom level than did the teachers.
4. There was no significant difference found in the four other categories of student achievement and instruction, student motivation, communication and collaboration, and lesson planning with the knowledge of technology standards.

In summary, this pilot study indicated that there was no significant difference between leaderships' and teachers' technology use competence. However, the results of the pilot study indicated fairly significant discrepancies in the beliefs of leadership and teachers in three key areas of leadership for technology use: (a) access and technical

support, (b) professional development or training, and (c) support for integration. These findings inspired the researcher to investigate other possible beliefs held by school leaders and teachers concerning support factors that affect technology integration. In addition to the use of a survey as was done in the pilot study, the researcher determined that further investigation through the use of interviews following survey data analysis could help provide additional insight to these leader and teacher beliefs concerning support for technology integration.

Description of Population

The site location was a mid-sized suburban public school system located in the southeastern region of the United States of America. There are approximately 14,470 students and 1,110 certified staff members. This system consists of eleven elementary schools, three middle schools, three high schools, one alternative education school for grades 6-12, and one magnet school for science and technology. The construction of a new middle school and a new career/technical high school were underway but neither school was completed before the data collection phase of this study.

In this system there were approximately 1,110 certified personnel. The average years of education experience is 23 years with about half of the personnel in the 11-30 year range. The majority of the personnel was female (77%) and white (85%). Over half of the personnel held advanced degrees. Table 2 shows the demographic breakdown of the certified personnel according to the 2004-2005 state report card (the most recent data available at the time).

Table 2

Demographic information from the 2004-2005 state report card

Certified personnel	Total – 1110 Administrators – 58 Classroom teachers – 954 Support personnel - 91
Average years of experience in education	Total average – 23 years 1-10 years - 45% 11-20 years - 28% 21-30 years - 22% > 30 years – 5%
Sex	Female - 77% Male - 23%
Highest degree held	Bachelor degrees - 43% Master degrees - 42% Specialist degrees - 12% Doctorate - 3%
Race	White - 85% Black - 14% Asian, Hispanic, and Multi-racial combined. - < 1%

There were approximately 14,470 students enrolled in grades Pre-kindergarten through 12. Of these students, 46% are White, 41% are Black, 3% are Asian, 6% are

Hispanic, and 3% are multi-racial. No students are identified as Native American. Forty-six percent of students are eligible for free and reduced lunch.

The state Criterion Referenced Competency tests (CRCT) are administered to students in the spring and are currently gateway tests to the next grade at the 3rd grade level. These state-normed tests are criterion-referenced tests designed to measure student acquisition of knowledge, concepts and skills set forth in the state quality core curriculum (QCC) and performance standards (GPS). The tests address the content areas of reading, English/language arts, math, science and social studies. The purpose of the tests is to diagnose individual student and program strengths and weaknesses as related to the instruction of the QCCs and GPS and to measure the quality of education in the state. At the third grade level, 90% or more of the students achieved the meets or exceeds expectations level in all areas. At the 8th grade level, 81% or more of the students achieved at the meets or exceeds expectations level in all areas except math, in which there were 70% to meet or exceed level. For the high school graduation test (given at the end of 11th grade), the percentage to meet or exceed standards on the first administration varied, with the first time rating for the content areas being English/language arts at 98%, math at 96%, social studies at 96% and science at 82%. The average SAT score for the school system was 1005, above the state average of 989 and slightly below the national average of 1020.

Approval to conduct the study was received in writing from both Georgia State University and East Central Public Schools district (pseudonym) before commencement of the study. Participation in this study was voluntary. An informed consent letter was made available to the subjects at the beginning of survey administration so subjects could

make a choice as to participate or not. Additionally, an informed consent letter (Appendix B) was given to the subjects before the interview process so participants could make an informed decision on their participation in the second phase. Participants were assured of their anonymity. System administrators were given guarantee that the identification of the system participating in the study, including the participants, would remain anonymous in the final report (Appendix C).

Units of Analysis

Merriam (1998) states that the selection of individual cases by a researcher is purposeful and "the selection depends upon what you want to learn and the significance that knowledge might have for extending theory or improving practice" (p. 179). In Phase One of this mixed-method study, the entire population of school leaders and teachers in this public school system was requested to complete the survey. Participation was voluntary. Participants in the leadership level were defined as principals, assistant principals, Instructional Lead Teachers, and Instructional Technology Specialists. The teacher group consisted of certified classroom teachers in all grade levels kindergarten through twelfth grade, with 77% of the respondents representing the academic content areas of language arts, math, science, and social studies. This was important because content teachers are more likely to have consistent technology access than are areas such as music, art and physical education. The final layer of analysis of the survey data identified three independent units as extreme or unique cases, including one elementary school, one middle school, and one high school. An extreme case was defined as one in which the school leaders and teachers had the greatest statistical difference in the beliefs about teaching with technology (Yin, 2003). Each of these three selected schools

represented a case. This representative case was selected because the researcher believed this would provide more interesting and rich data for analysis.

The Phase Two interview participants were purposefully selected from leaders and teachers within each of the identified extreme cases, including one leader (the school principal) and two teachers in each identified case. Teachers were selected to represent a variety of grade levels, content areas, and years of teaching experience. By employing a multiple case study design, the generalizability and the validity of the findings were expanded (Yin, 2003).

Researcher's Role and Bias

For this study, the researcher's biases and assumptions resided in her own experiences as a teacher and as the district level Instructional Technology Coordinator. In her capacity as the Instructional Technology Coordinator, she worked with the Technology Director, Instructional Technology Specialists (ITS) and school leadership to improve and increase the use of instructional technology at the classroom level. Because of her background, the researcher held the assumption that integration of technology in teaching is important and should be actively supported by the school leadership. She realized her bias favored high cognitive levels of technology integration into an interactive classroom environment. She also held the assumption that some of the school-based leadership and ITS could take more purposeful actions to support the teachers with integration. Prior to data collection and analysis, the researcher reflected on how these assumptions could affect the research.

In this study the researcher was in the role of a central office employee and a researcher, which she realized could also have some impact on the participant perception

of their participation. To increase neutrality, the researcher maintained a reflective journal, conducted member checks, and conducted peer reviews. She continuously reflected on the process and her reactions to the process and recorded those questions and reactions in her journal. The researcher sustained a clear focus on the purpose of the study and the questions the research addressed to maintain her commitment to the ethical boundaries required of a researcher's neutrality.

Propositions

The propositions of this study were the following: (a) The school leaders' beliefs about the support factors concerning classroom technology integration has an effect on the actions they take in supporting and encouraging teachers to integrate technology in the classroom, and (b) The classroom teachers' integration of technology into the classroom is influenced by their beliefs concerning the support factors provided by the school leaders.

A theory is an interrelated set of constructs formed into propositions or questions that specify the relationship among variables and help explain phenomena that happen in the world (Creswell, 2003). This study's propositions were based on Pajares' (1992) fundamental theoretical assumptions on the functions of educational beliefs:

1. Knowledge and beliefs are inextricably intertwined, but the potent affective, evaluative, and episodic nature of beliefs makes them a filter through which new phenomena are interpreted.
2. Epistemological beliefs play a key role in knowledge interpretation and cognitive monitoring.

3. Belief substructures, such as educational beliefs, must be understood in terms of their connections not only to each other but also to other, perhaps more central, beliefs in the system. Psychologists usually refer to these substructures as attitudes and values.
4. Individuals' beliefs strongly affect their behavior.
5. Beliefs must be inferred, and this inference must take into account the congruence among individuals' belief statements, the intentionality to behave in a predisposed manner, and the behavior related to the belief in question (p. 326).

Phase One – Quantitative Survey

Research Questions

The broad question that guided the quantitative portion of this study was:

> Is there a difference between the school leaderships' beliefs about classroom technology integration and the teachers' beliefs about classroom technology integration?

Specifically, Phase One of this research sought to answer the following question:

Is there a difference between the school leaderships' beliefs concerning support factors that affect technology integration and teachers' beliefs concerning support factors that affect technology integration?

The sub-questions for the survey section concerning the "Degree to which you believe each factor will enable you to effectively use technology" were the following:

1. Is there a difference between the school leaderships' beliefs about the provision of general administrative support for teachers and the teachers' beliefs about the provision of general administrative support for teachers?

2. Is there a difference between the school leaderships' beliefs about the provision of professional development opportunities to increase knowledge about computers and integration and the teachers' beliefs about the provision of professional development opportunities to increase knowledge about computers and integration?

3. Is there a difference between the school leaderships' beliefs about the provision of access to appropriate resources and teachers' beliefs about providing access to appropriate resources?

4. Is there a difference between the school leaderships' beliefs about the leaderships' establishment of a school vision and/or culture for integration and the teachers' beliefs about the leaderships' establishment of a school vision and/or culture for integration?

The sub-questions for the survey section concerning the "Likelihood that these factors will occur at your school system" were the following:

5. Is there a difference between the school leaderships' beliefs about the provision of general administrative support for teachers and the teachers' beliefs about the provision of general administrative support for teachers?

6. Is there a difference between the school leaderships' beliefs about the provision of professional development opportunities to increase knowledge about computers and integration and the teachers' beliefs about the provision of professional development opportunities to increase knowledge about computers and integration?

7. Is there a difference between the school leaderships' beliefs about the provision of access to appropriate resources and teachers' beliefs about providing access to appropriate resources?

8. Is there a difference between the school leaderships' beliefs about the leaderships' establishment of a school vision and/or culture for integration and the teachers' beliefs about the leaderships' establishment of a school vision and/or culture for integration?

(See Appendix D for a correlation between research questions and survey questions.)

Research Design

In quantitative research, the purpose of a survey is to be able to generalize from a sample group to a larger population so inferences can be made about various attitudes, characteristics, and/or behaviors of this population (Babbie, 1990; Creswell, 2003). A survey is an investigation in which information is systematically collected, but in which the experimental method is not used (Creswell, 1994). A survey was the preferred type of data collection procedure for the first part of this study because of the economy of the design and the rapid turnaround on data collection. It also helped identify the attributes of a large population from a small group of individuals.

Although participation was voluntary, the entire population of school leaders and teachers in this public school system were requested to complete the survey. The school leadership received the survey in a paper format during a monthly meeting and the teachers received the survey in an online electronic format. The survey was completed using a cross-sectional design that collected beliefs and practices of two different groups

(leaders and teachers) at one point in time (Creswell, 2003). Data gained from analysis of this survey was used to inform and guide the Phase Two interview questions.

Instrument

The survey used, *Beliefs About Teaching with Technology (BATT)* was developed by Lumpe and Chambers (2001) and was designed to assess teacher's context beliefs about using technology in the classroom. It consisted of two sets of 14 questions about school environmental support factors and barriers that may have an impact on using technology effectively in the classroom (Appendix A). The first set of questions addressed the "Degree to which you believe each factor will enable you to effectively use technology" and the second set addressed the "Likelihood that these factors will occur at your school system." Development of the survey content was based on the research by Ford's (1992) Motivation Systems Theory and Bandura's (1997) research on self-efficacy. Self-efficacy refers to an individual's generalized expectancy concerning the individual's beliefs concerning his or her own ability to perform certain professional tasks as well as the ability to influence students. Teachers' context and self-efficacy beliefs were significant predictors of teachers' reported use of technology-related engaged learning practices.

Development of instrument items and establishment of content validity was based on studies with two groups of participants. The first group (n=20) were teachers participating in technology-related graduate studies. The second group (n=307) were teachers participating in a large-scale technology professional development program and was used to test the instrument items. All of these participants were educators in rural or

small-city school districts in the Midwestern United States, 78% female, 59.5% with bachelor's degrees, and an average teaching experience of 14.8 years.

Fourteen statements of contextual factors related to use beliefs that impact teachers' beliefs about technology use were found in this study. These statements included the following aspects: resources, professional development, internet access, quality software, classroom structures, administrative support, parental support, teacher support, technical support, planning time, time for students to use technology, class size, mobile equipment, and proper connections. Results from Lumpe and Chambers' (2001) analysis indicated the BATT to be a valid and reliable instrument for measuring teachers' context beliefs about teaching with technology. The factor analysis revealed that the teachers' responses resulted in two clearly distinct factors, Enable beliefs and Likelihood beliefs. Alpha coefficients for the Enable and Likelihood subscales were quite high ($\acute{\alpha}$=.88 and $\acute{\alpha}$=.87, respectively). The researchers concluded that assessment of teachers' beliefs as related to technology integration is important so that teachers' belief patterns may be used as a needs assessment and program evaluation tool.

Statistical Treatment of the Data

Several different approaches were used to analyze the survey data. There was an analysis of the data for mean values and standard deviations in the beliefs concerning support factors that affect technology integration between school leaders and teachers by each of the fourteen independent statements and then again by the grouped categories. This provided descriptive data from the sample population.

In order to determine if there is a significant difference between the responses of the leadership participants and the responses of the teacher participants, statistical

analysis was conducted on individual statements and then on grouped categories of the statements. A MANOVA test was run using all fourteen statements (test one). Where a significant difference was found between groups, follow-up analysis was conducted. The fourteen statements identified by Lumpe and Chambers (2001) was sub-divided into four of the five conceptual categories of support identified by the pilot study and the literature review (Appendix D). (The fifth area, provision of pressure and incentives for integration, was only addressed in Phase Two of the study.) A categorical MANOVA for the four conceptual categories (general administrative support, professional development opportunities, access to appropriate resources, school vision and/or culture for integration) was run as additional analysis. Mean values and standard deviations were run by school at each of the three different levels to identify the schools used for the interviews (see the next section about Phase Two for more information).

The Alpha level for this study was set at $\acute{\alpha}= .05$. Where follow-up tests were needed, the alpha was set at $\acute{\alpha}=.001$. Data was compiled and analyzed using the computer software Microsoft Excel and the Statistical Package for the Social Sciences (SPSS). The results of the Phase One analysis are presented and discussed in Chapter 4.

Population

The entire population of school leaders and teachers in this public school system was asked to complete the survey. The population sample was planned to include all principals (N=18), all assistant principals (N =18), all Instructional Lead Teachers (N =11), all Instructional Technology Specialists (N =19), and a minimum of 40 teachers from each of the elementary, middle and high school levels (N =120). The participation goal was 36 members of the leadership sample (one or two at each of the schools), a

minimum of ten teachers from each of the eleven elementary schools, and twenty teachers from each of the three middle schools and from each of the three high schools. A minimum total of 120 participants were determined to be necessary to provide a valid analysis of the main research hypothesis. Actual participation in the survey was over 500 participants within a two-week time frame which well exceeded the participation goal. Additional questions for demographic information were included in the survey, including position held, total years experience in education, years in this system, current position in the school, and completion of computer competency requirement. Participants in this phase of the study represented three schools identified as extreme cases by the survey analysis; one elementary, one middle, and one high school. Each participant had been at their current school for a minimum of three years. Tables 3 and 4 illustrate the profile of the participants in Phase Two and Figure 2 shows the sampling plan for the survey data analysis.

Table 3

Profile of teacher participants for the school year 2005-2006

	School	Grade	Subject	Yrs of Experience	Yrs in Eastland	Yrs at School
Pam Miles	North Elementary	3rd	All	4	4	4
Tamara Cates	North Elementary	5th	All but Soc.Studies	8	8	8
Susan Jones	Central Middle	6th -8th	Gifted: Lang. Arts, Reading	22	6	6
Paul Davis	Central Middle	7th	Science	4	3	3
Tesa Moore	West High	9-12	Mathematics	20	14	5
Hal Johnson	West High	9-12	Soc.Studies AP Art History	20	20	20

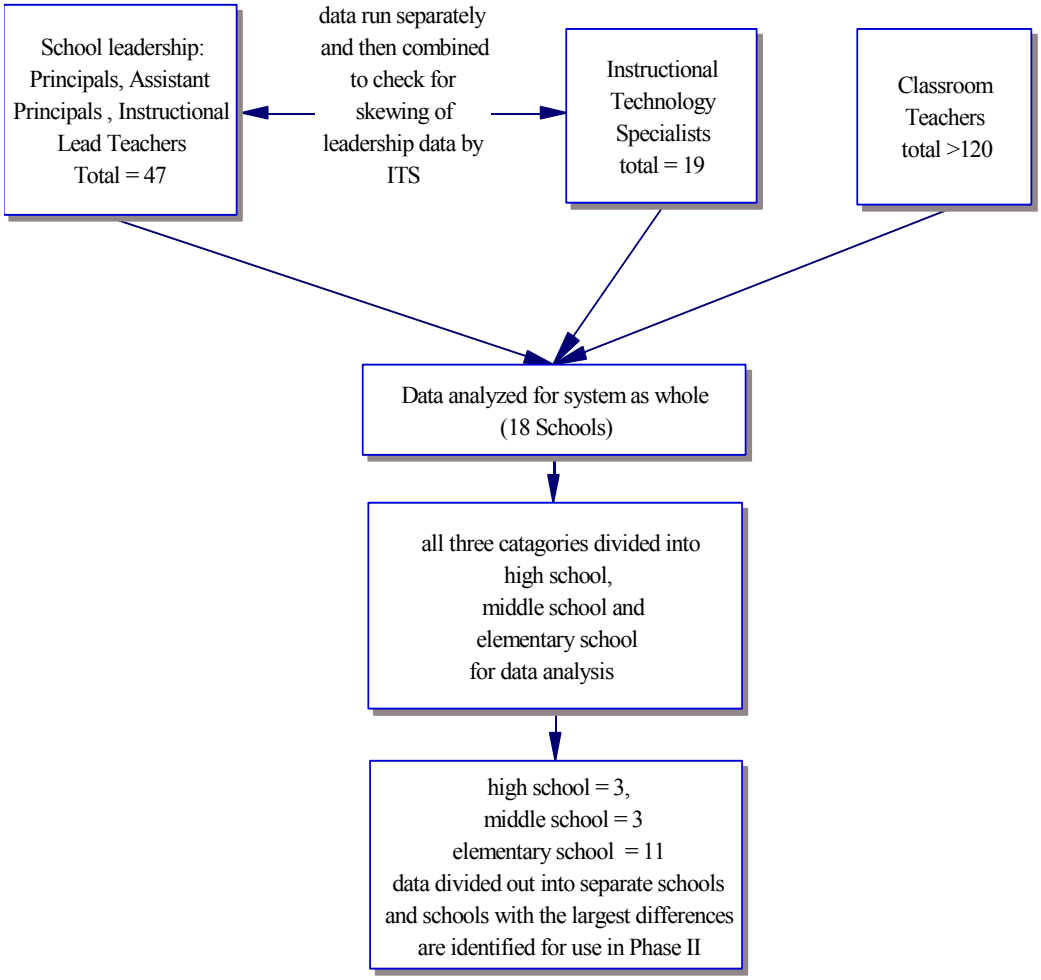
Table 4

Profile of leader participants for the school year 2005-2006

Leader	School	Yrs of Experience	Yrs as Principal	Yrs in Eastland	Years at School
Holly James	North Elementary	32	5	27	27
Bob Graves	Central Middle	14	1	3	3
Frank Grant	West High	16	7.5	9	9

Figure 2

Sampling scheme for survey data analysis



The researcher used a response bias check for respondent-non-respondent. After the final survey submission date had passed, four teachers were contacted by email and asked for their responses on four key items to determine if their responses were substantially different from respondents. The similarities in this comparison were used to determine that there was not a response bias present (Creswell, 2003).

Phase Two – Qualitative Interviews

Research Questions

Phase Two of this research project built upon, refined and helped explain data gained from Phase I by answering these questions:

1. What are school leaders' beliefs about the support role they play in teacher integration of instructional technology?
2. What are teachers' beliefs about the support role that school leadership plays in teacher integration of instructional technology?
3. How do school leaders describe the support they provide for teacher integration of technology in the classroom?
4. How do teachers describe the support they receive from school leaders for their integration of technology in the classroom?

Research Design

Interviews

The interview is a powerful method of data collection that provides one-to-one interaction between the researcher and the individuals being studied. It provides an opportunity to ask for clarification if an answer is vague or provides clarification if a question is not clear. Open-ended interviews result in abundant information about issues that might lead to conceptualizations of the issues in ways totally different from what was anticipated (Tashakkori & Teddlie, 1998). Yin (2003) described interviews as "guided conversations rather than structured queries" (p. 89). The qualitative phase of this study consisted of one-on-one interviews conducted by the researcher with purposively selected participants who agreed to participate.

The purpose of interviewing is to allow us to enter into the other person's perspective. Qualitative interviewing begins with the assumption that the perspective of others is meaningful, knowable, and able to be made explicit. Researchers interview to find out what is in and on someone else's mind (Patton, 2002). Kvale (1996) detailed the purpose of the interview as finding out how people understand their world and their life from their point-of-view and described the interview as "the construction site for knowledge" (p. 14). He cited six criteria of a quality interview:

1. The extent of spontaneous, rich, specific, and relevant answers from the interviewee.
2. The shorter the interview's questions and the longer the subjects' answers, the better.
3. The degree to which the interviewer follows up and clarifies the meanings of the relevant aspects of the answers.
4. The ideal interview is to a large extent interpreted throughout the interview.
5. The interviewer attempts to verify his or her interpretations of the subject's answers in the course of the interview.
6. The interview is "self-communicating" — it is a story contained in itself that hardly requires much extra descriptions and explanations (Kvale, 1996, p. 145).

The three main purposes for these interviews were to (a) help provide a fuller, more in-depth picture of the actual beliefs of individuals in leadership positions and individuals in teaching positions about availability of the support factors that enable technology integration; (b) examine the stated beliefs of the individuals in leadership and teaching roles to try to determine if their beliefs are related or disparate; and (c) describe or define the actions school leaders and teachers take that demonstrate action on their beliefs about teaching with technology. Overall, the interviews were to assist in the nature an essence of any belief differences discovered in the survey analysis.

According to Creswell (2003), in a two-phase, sequential project in which the second phase elaborates on the first phase, it is difficult to exactly state the second phase

questions in the proposal phase. However, after the study is completed, the researcher can state the questions of both phases in the final report. Following Phase One of the study, the researcher finalized the interview questions to reflect the items from the survey that showed differences in beliefs concerning availability of the support factors that enable technology integration, and she focused on the support concepts related to school vision, current classroom uses, and instructional practices. The content of these interviews focused on the categories referenced in the literature and pilot study results: (a) provision of general administrative support for teachers, (b) provision of professional development opportunities to increase knowledge about computers and integration, (c) provision of access to appropriate resources, (d) establishment of a school vision and/or culture for integration, and (e) provision of pressure and incentives for integration. The interview questions addressed these categories. The wording of the questions for leaders and teachers was similar but varied slightly within questions to address the different position's perspectives.

Interviews can vary from highly structured, with specific questions in a specific order, to unstructured forms that only include topic areas for the researcher to explore with participants (Kvale, 1996; Merriam, 1998; Patton, 2002). The largest percentages of qualitative interviews are semi-structured (Merriam, 1998). Kvale (1996) stated that a semi-structured interview was "neither an open conversation nor a highly structured questionnaire" (p. 27). Yin (2003) encouraged the developing of "how" and "why" questions since answers are likely a description of the experience and generally initiate a thick, rich description.

Semi-structured interviews combine the structure and direction of the survey instrument with the flexibility of the unstructured, open-ended interview to produce focused qualitative data. Questions are pre-constructed but the answers can be open-ended in order to be expanded upon by the interviewee with probes used by the interviewer (Schensul, Schensul, & LeCompte, 1999). This type of direct administration of interviews by the researcher can help obtain more valid responses because of the improved rapport created between interviewer and interviewee. This method can also give the interviewer a better intuitive understanding of the responses.

Kvale (1996) emphasized the importance for gathering an understanding of the concepts and how those concepts are interpreted, the verification of the meaning, and how the data would be reported during the interview. Probing questions that generate in-depth answers are vital because they enhance to this verification process. After the interview was transcribed, the participant was given the opportunity to read the transcription for verification and clarification. Then analysis of the interview was conducted. Since the interview questions elaborated on data previously collected in the survey phase, only one interview per participant was conducted; however, permission to return for further clarification on responses was requested by the researcher and follow-up clarification was obtained by email as needed.

There are drawbacks to interviews. Following specific guidelines can help produce an ideal interview, but errors can still occur. These errors commonly evolve from three sources: a) the behavior of the respondent, as when the respondent purposely omits some pertinent information or gives a response meant to please the interviewer; b) the questionnaire type or wording of the questions; and c) a flawed questioning techniques by

interviewer, such as rewording of questions during the interview (Fontana & Frey, 1994). These negatives were kept in mind by the researcher as the interviews were used as a data collection model. The researcher attempted to avoid interview errors by using peer reviewers, cross-referencing interview responses with other collected data, and asking follow-up questions via email if clarification was needed. Although she was a still novice interviewer, this researcher had practiced interviewing in the process of conducting research for her Specialist in Education degree, during her pilot study, and under the guidance of professors in research coursework. She used the knowledge gained from these experiences as she conducted this research project's interviews.

The interview questions reflected the items from the survey that showed differences in beliefs concerning availability of the support factors that enable technology integration and focused on the support concepts related to school vision, current classroom uses, and instructional practices. These questions allowed the researcher to explore the participant's beliefs about teaching with technology as well as how and why the participants held those beliefs (Appendix E). The wording of the questions for leaders and teachers was similar but varied slightly within questions to address the different position's perspectives. The interviews also addressed the categories referenced in the literature and pilot study results: (a) provision of general administrative support for teachers, (b) provision of professional development opportunities to increase knowledge about computers and integration, (c) provision of access to appropriate resources, (d) establishment of a school vision and/or culture for integration, and (e) provision of pressure and incentives for integration.

Participants were interviewed once in May or June 2006. Each participant volunteered to be interviewed on the BATT survey they had completed in March of the same year. Each interview subject participated in one semi-structured interview that lasted approximately 45-60 minutes. In order to record the interviews more thoroughly, each interview was audio-taped and later transcribed by a third party professional hired by the researcher (Schensul, Schensul, & LeCompte, 1999). An interview protocol was used that included an introductory statement followed by the key questions to be asked. A paper copy of the questions was available for those respondents who were more visually oriented to be able to refer to if they so desired. Participants were provided the opportunity to read each interview transcription to provide interpretive analysis and revise, retract, or add statements they believed would more accurately reflect their perspectives. While this opportunity was provided, no participant wished to make any changes. When the researcher needed further clarification on any points of the interview, follow-up was conducted with the participant via email. The interviews were transcribed, reviewed, coded and categorized. Patterns were noted and categories were determined from the perspective of each participant in regard to their beliefs about various aspects of technology integration.

Sampling Procedures/Participants

Purposeful sampling is selecting participants based on the assumption that the researcher wants to "discover, understand, or gain insight and therefore must select a sample from which the most can be learned" (Merriam, 1998, p. 61). Purposeful or criterion-based selection was used to choose the population sample for Phase Two (LeCompte & Schensul, 1999). The focus for this study was on selecting extreme cases

that enrich the findings of the study rather than gathering information from a large statistical representation. An extreme case was defined as one in which the school leaders and teachers had a statistically different view of the beliefs about teaching with technology (Yin, 2003). This type of representative category was selected because the researcher thought this would provide more interesting and rich data for analysis.

The participants in this phase were purposefully selected from leaders and teachers within each of the identified extreme cases, including one leader (the principal) and two teachers in each identified case. Teachers were selected to represent a variety of grade levels, content areas, and years of teaching experience. The researcher selected participants from the extreme cases by using the following criteria:

1. Participant indicated a willingness to participate in the interviews as indicated on the survey from Phase One.
2. Participant was currently employed at one of the identified extreme case schools and had been employed in the system for at least two full school years.
3. Participant held a leadership position or certified teacher position.

Other Data Sources

Other sources of data were gathered from applicable artifacts. The Level of Technology Integration (LoTI), developed by Moersch (2001), is a self-reported questionnaire that is completed online each year by certified teaching staff to obtain an overall snapshot of the level of technology integration being practiced at each school. Computer lab usage reports are basic database reports that record information about the teacher's instructional use of labs. These are printed and submitted quarterly by each

school Instructional Technology Specialist. During the 2004-2005 school year, this system participated in the Southern Association of Colleges and Schools accreditation project to establish accreditation of the schools for five additional years. Part of this report included comments on the schools' technology integration status. These documents were used by the researcher for additional insight of the beliefs and related actions concerning technology integration at the schools selected for participation in the case study, and to add richness to the context description of each of these cases.

Data Analysis and Validity

The data analysis of the qualitative phase involved coding and clustering of the interview data. Basic qualitative analysis is inductive in that the researcher analyzes an initial unit of data and compares it to another unit of data, searching for a common theme across the data set. Coding involves organizing data into categories related to the guiding questions and framework of the research so that they can be used to support analysis and interpretation. Codes are operational names and symbols used to stand for a group of similar ideas, items, or phenomenon that the researcher notices in her data (Schensul, Schensul, and LeCompte, 1999). The resulting themes, or codes, can change to fit later data (Merriam, 2002).

LeCompte (1998) suggests three levels of analysis when using inductive reasoning. Item level analysis identifies items or units and creates taxonomies which classify and orders those items or units. The pattern level then establishes linkages among the taxonomies or classifications. The structural level of analysis, also called the interpretive or constitutive level of analysis, organizes relationships among patterns into

structures. Interpretation then provides meaning of structures in relation to existing or new theoretical frameworks and paradigms.

Glaser and Strauss (1999), the designers of the constant comparative model, describe qualitative data analysis as a process of separating data into discrete items, chunking the items or units into categories to find its characteristics and structure, aggregating the categories into structures and factors, and then looking for the connections between the categories, structures or factors. Noting the similarities and differences helps to provide clarity to the categories and differentiates one category from another. The researcher then selects or develops theories to assist in explanation or theoretical concepts.

This researcher implemented a combination of Lecompte's (1998) and Glaser and Strauss' (1999) methods of data analysis on the interview data. A codebook was created based on identifying subcategories of support factors from the main categories addressed in the interview, or meaning categorization (Kvale, 1996). The researcher anticipated that some of the coding results would address the categories suggested by the literature review: (1) general administrative support for teachers, (2) professional development opportunities, (3) access to appropriate resources, (4) establishment of a school vision and/or culture, and (5) pressure and incentives. However, the researcher also recognized that additional categories might emerge that either added to or refuted these categories during the open coding process. During the interviews, a few ideas were mentioned by a couple of individuals that did not fit appropriately within one of the five above named categories, but these were not mentioned by more than one or across participants, so no additional categories were established for the findings (techno-savvy individual; self-

motivated; early adopter; some teachers are reluctant users; teachers don't want to change)

A content analysis was completed to determine appropriate categories and associated codes for the answers to the interview question. In this stage, the researcher read the interviews a minimum of three times and then reviewed data, highlighted phrases, and identified patterns of key words and phrases that related to the purpose of the study. These words and phrases were identified and clustered into similar topics or categories and coded. These subcategories and their codes were then added to the codebook.

Next, the researcher compared this data with pieces from the next set of data, noting similarities and differences to verify and confirm consistency. The researcher then determined if the pieces of data held similar or different themes, and if those themes related to an existing framework or exposed new conceptions. Additionally, the text of the interviews was searched for useful and pertinent quotes that related to the topics and categories determined through analysis.

Reliability

Analysis can be made reliable by using standard methods and checks that ensure that different readers arrive at the same meanings from analyzing pieces of data (Kvale, 1996). Kvale also noted that reliability "pertains to the consistency of the research findings" (p. 235) and should be addressed by the researcher during interviewing, transcribing, and analysis. During transcription, procedures regarding what should be transcribed should be addressed and reliability checks performed in which the researcher compares tapes with transcripts.

It is also important that the researcher be cognizant of not asking leading questions in the interview process (Kvale, 1996). Open-ended questions will be asked with no intent on the part of the researcher for a response regarding a particular point-of-view. To further add to the reliability of the study, the researcher allowed the participants to read the transcription of the interviews for consistency in the researchers understanding and the participant's intent. By allowing the participants to read the transcriptions for validation as to the accuracy and clarity of their statements, as well as providing them with copies of the researcher's interpretation of the data, there was an increased level of reliability of the research-member checks.

Validity

There are a variety of means to ensure validity while conducting and analyzing research (Creswell, 2003; Merriam, 2002; Yin, 2003). The researcher implemented the following strategies to ensure internal validity in the research process:

1. Triangulation — the use of multiple methods, investigators, and/or data sources to validate data that the researcher collects (Creswell, 2003). In this project, triangulation was achieved mainly through the combined use of surveys and interviews. The other data sources previously discussed added additional insight and details to the context of the study. (See Appendix F for a correlation of research questions and context information to data sources.)
2. Peer debriefing — the process of allowing colleagues familiar with or new to the research to read and comment on emerging findings. For this project, the researcher obtained assistance from at least two colleagues familiar with

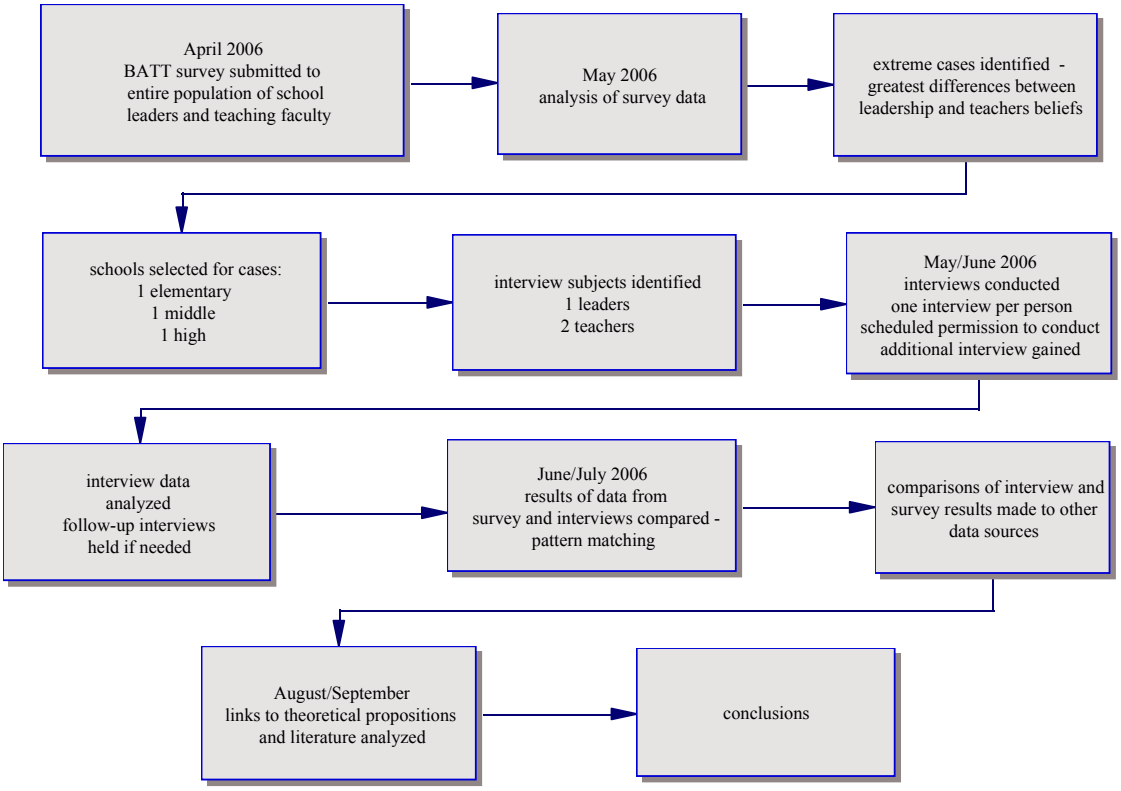
instructional technology and the K-12 school environment to assist with peer debriefing.

3. Researcher self-reflection — the process of the researcher reflecting upon the research process to consider his or her biases and assumptions regarding the research. The researcher kept a journal of experiences to reflect continually on the process and data analysis. (see Appendix G for sample selection from journal)

External validity is the ability to generalize the findings of a study beyond the immediate study (Yin, 2003). Although the results of the survey are statistics-based, the researcher does not expect or intend for the results of either phase of this study to be generalized outside the immediate population used in this research. Figure 3 gives an overview summary of the research procedure for both phases.

Figure 3

Overview of research procedure



Summary

Through a mixed-method case study approach, the researcher sought to examine the relationship between the beliefs of school leaders and the teachers concerning classroom technology integration. Based on a review of the literature, this study addressed a gap in existing studies on providing leadership and support for teacher technology integration and beliefs in education. The researcher used a two phase, mixed-method approach with quantitative and qualitative procedures and analysis.

Data was collected through surveys with a sample population. Data gained from the surveys were used to identify the cases to be studied through interviews. Data from the surveys were analyzed with several different approaches using statistical analysis

software. Interviews were analyzed using coding and comparative analysis. Additional data were obtained through artifacts. All data were then further analyzed by pattern matching between the findings of the quantitative and qualitative analyses. The use of multiple sources of data, member checks, peer review, a critical partner and self-reflection were used to strengthen validity and reliability. Chapter Four presents the results of the quantitative data analysis and a discussion of the data as they relate to each research hypothesis.

CHAPTER FOUR

ANALYSIS OF THE QUANTITATIVE DATA

The data from Phase One of this study were used to begin the investigation on the overall research question "Is there a difference between the school leaderships' beliefs about classroom technology integration and the teachers' beliefs about classroom technology integration?" More specifically, Phase One of this research sought to answer the following question:

Is there a difference between the school leadership and the teachers in their beliefs concerning support factors that affect technology integration?

The survey data gathered in this phase investigated the broad question:

Is there a difference between the school leaderships' beliefs concerning support factors that affect technology integration and teachers' beliefs concerning support factors that affect technology integration?

The sub-questions investigated stated that there were no significant differences between school leaders' and teachers' enabling and likelihood beliefs in the areas concerning: (a) the provision of general administrative support for teachers; (b) the provision of professional development opportunities to increase knowledge about computers and integration; (c) the provision of access to appropriate resources; and (d) the establishment of a school vision and/or culture for integration.

This chapter contains a general analysis of the data using descriptive and inferential statistics to measure the relationships as they relate to each research question. The computer programs Microsoft Excel and Statistical Package for the Social Sciences (SPSS v13) were used to assist in the statistical analysis of the data.

Report of the Data

Sample Characteristics

The sample for the Phase One portion of this study consisted of K-12 school leaders and teachers employed in the target public school system that voluntarily completed the survey and submitted their results within a two week time frame. There were a total of 552 participants in this phase, 48% of the total eligible population. In the leadership category, participants included 46 (97%) school administrators (Principals, Assistant Principals, and Instructional Lead Teachers) and 19 (100%) Instructional Technology Specialists. Participants also included 487 (53%) classroom teachers or other school-based certified personnel (i.e. school counselors). All three school levels were represented with 47% of participants working at the elementary school level (out of eleven schools), 26% of participants at the middle grades (6–8) level (out of three schools), and 27% of participants at the high school (9–12) level (out of three schools). Seventy-seven percent of the teacher participants were teaching an academic content area (language arts, mathematics, science, or social studies) and the other 23% worked in counseling, physical education, fine arts, foreign language, career/technical programs, or other academic non-core content areas.

In years of experience in education, 45% had 0-10 years and 55% had 10-30+ years. In addition, 49% of participants had worked in the school system for three or more

years, 22% previously worked in another Georgia school system, 8% worked in a school system outside of Georgia, and 20% were new to teaching from either school or another profession. Thirty-five percent of participants had been at their current school for two years or less, with 65% having three or more years experience at their school. Ninety-eight percent of all participants in this survey indicated that they had met or would meet the state and system mandated technology proficiency requirement by the June 30, 2006 deadline. The detailed demographic characteristics of the school leaders and teachers who participated in Phase One of this study are found in Table 5.

Table 5

Demographics of Phase One research participants

Certified personnel	Total	552 (48%)
	Principals, Assistant Principals and Instructional Lead Teachers (school leaders)	46 (97%)
	Instructional Technology Specialists	19 (100%)
	Classroom teachers or other school-based certified personnel–	487 (53%)
Years of experience in education	0 - 2 years	71 (12%)
	3 – 10 years	178 (33%)
	10 - 20 years	147 (27%)
	20 – 30+ years	152 (28%)
Years at current school	0 - 2 years	187 (35%)
	3 – 10 years	244 (46%)
	10 - 20 years	84 (14%)
	20 – 30+ years	35 (5%)

School level at which one works	Elementary (PK – 5)	241 (47%)
	Middle Grades (6 – 8)	126 (26%)
	High School (9 – 12)	133 (27%)
Academic area taught (certified non-leadership)	Language arts	69 (14%)
	Social studies	44 (8%)
	Math	50 (10%)
	Science	47 (9%)
	All areas (elementary)	171 (36%)
	Other areas (PE, fine arts, counseling, non-core academics, career/technical)	119 (23%)
Years experience at current school or where located prior to this school if less than 3 years	In this system 3 or more years	246 (49%)
	I worked in another Georgia school System.	111 (22%)
	I worked in a school system outside of Georgia.	41 (8%)
	I was a full time student.	61 (12%)
	I was not employed in a school system.	40 (8%)
Technology proficiency requirement for Georgia/Rockdale County completed	All levels and positions– 490 (98%)	

Statistics of Samples Studied

Level One Analysis

The survey data was initially analyzed for mean values and standard deviations for each of the fourteen independent variables of the beliefs concerning support factors that affect technology integration. This analysis provided descriptive data from the sample population. The mean and standard deviation was determined for the total group

of participants, then again for the sub-groups of school leaders and teachers. The rating scale for this instrument was based on the rating of 1 – 5 with each of the responses correlating with a number in the scale: 1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; and 5 = strongly agree.

Analysis was conducted first for the 14 variables for the section "Degree to which you believe each factor will enable you to effectively use technology" (enabling beliefs). Then the same analysis was completed for the same 14 variables for the section "Likelihood that these factors will occur at your school" (likelihood beliefs). Overall, the full group of participants saw "time to let students use technology" as the factor that would most enable them to effectively use technology, with a mean of 4.54. "Support from parents" was seen as the factor that participants believed would least enable them to effectively use technology, with a mean of 3.71. When the likelihood that these factors would occur in their school was examined, participants believed that "access to the internet" was the factor most likely to occur, with a mean of 4.33. "Smaller class sizes" was the factor believed to be the least likely to occur, with a mean of 2.79. The data for the entire group are shown in Table 6 and Table 7.

Table 6

Degree to which you believe each factor will enable you to effectively use technology - full group

	N	M	S.D.
Time to let students use technology	546	4.54	.75
Technical support (technician)	549	4.49	.84
Proper connections	546	4.47	.81
Quality software	550	4.46	.78
Physical classroom structures	549	4.45	.86
Resources (funding, equipment, etc.)	551	4.44	.92
Time to plan for technology implementation	547	4.41	.85
Access to the Internet	547	4.39	.96
Smaller class sizes	546	4.38	.87
Support from school administrators	549	4.15	.97
Professional development opportunities	550	4.09	.93
Mobile equipment (laptops, etc.)	548	4.02	.93
Support from other teachers	548	3.84	.89
Support from parents	546	3.71	.89
Valid N (listwise)	526		

listwise: the number of respondents who answered all the questions on the list

Table 7

Likelihood that these factors will occur at your school - full group

	N	M	SD
Access to the Internet	540	4.33	.81
Support from school administrators	542	4.10	2.32
Technical support (technician)	539	4.04	.92
Quality software	541	3.88	.90
Support from other teachers	542	3.81	.81
Professional development opportunities	545	3.71	.95
Resources (funding, equipment, etc.)	544	3.53	1.01
Proper connections	543	3.52	1.04
Support from parents	541	3.45	.95
Time to let students use technology	542	3.40	1.07
Mobile equipment (laptops, etc.)	543	3.39	.97
Physical classroom structures	544	3.21	1.17
Time to plan for technology implementation	537	3.09	1.10
Smaller class sizes	539	2.79	1.20
Valid N (listwise)	507		

Analysis was then completed to determine the means and standard deviations for the sub-groups of school leaders and teachers to identify those factors believed to most enable effective use of technology and those believed to be most likely to occur at the school. At this point, in order to determine if the Instructional Technology Specialists (ITS) could be included in the school leadership population for the question analysis without skewing the findings either positively or negatively, differences in the responses of the leaders and ITS were examined. On the first set of the 14 variables related to enabling beliefs, there was only a 1 sign difference between the school leaders and ITS respondents. That difference was in the statement concerning “support from school

administrators." The ITS sub-group had a mean of 4.8 (*SD* = .37). The school leaders mean was 4.1 [(*SD* = 1.36), *t* (58) = -3.26, *p* = .002]. In the second set of 14 variables related to likelihood beliefs, there were no significant differences identified between school leaders and the ITS. Therefore it was confirmed that the ITS could be included in the school leadership group when further examining the questions.

In the enabling beliefs section of the survey, school leaders believed that "quality software" most enabled effective use (M = 4.56, SD = .71) and teachers believed that "time to let students use technology" was the factor that most enabled effective use (M = 4.54, SD = .76). The factor identified by both the school leader and teacher group as believed to be least important to enable one to effectively use technology was "support from parents" (M = 3.70, SD = .88 and M = 3.72, SD = .89, respectively).

For the section of likelihood beliefs, school leaders identified "support from school administrators" as the support factor most likely to occur (M = 4.56, SD = .60) and the school teachers believed that "access to the Internet" was the factor most likely to occur (M = 4.30, SD = .83). The school leaders and teachers agreed that the factor that could enable effective use of technology but was least likely to occur at the school was "smaller class sizes" (M = 3.18, SD = 1.11 and M = 2.73, SD = 1.21, respectively). Data for the sub-groups are shown in Table 8.1 through Table 8.4.

Table 8.1

Degree to which you believe each factor will enable you to effectively use technology-school leaders

	N	M	SD
Quality software	65	4.56	.71
Resources (funding, equipment, etc.)	65	4.54	.83
Time to plan for technology implementation	65	4.53	.59
Technical support (technician)	65	4.52	.73
Time to let students use technology	65	4.47	.73
Access to the Internet	65	4.43	.77
Professional development opportunities	65	4.40	.93
Support from school administration	65	4.33	1.20
Proper connections	65	4.27	1.00
Physical classroom structures	65	4.21	1.06
Smaller class sizes	65	4.07	.89
Support for other teachers	65	4.00	.87
Mobile equipment (laptops, etc.)	65	3.91	.99
Support from parents	65	3.70	.88
Valid N (listwise)	65		

Table 8.2

Degree to which you believe each factor will enable you to effectively use technology-teachers

	N	M	SD
Time to let students use technology	481	4.54	.76
Proper connections	481	4.49	.78
Physical classroom structures	484	4.49	.82
Technical support (technician)	484	4.48	.85
Quality software	485	4.45	.79
Resources (funding, equipment, etc.)	486	4.43	.93
Smaller class sizes	481	4.42	.86
Time to plan for technology implementation	482	4.39	.88
Access to the Internet	482	4.39	.98
Support from school administrators	484	4.13	.93
Professional development opportunities	485	4.05	.92
Mobile equipment (laptops, etc.)	483	4.04	.92
Support from other teachers	483	3.82	.89
Support from parents	481	3.72	.89
Valid N (listwise)	461		

Table 8.3

Likelihood that these factors will occur at your school - school leaders

	N	M	SD
Support from school administration	65	4.56	.60
Access to the Internet	65	4.52	.62
Technical support (technician)	65	4.33	.67
Professional development opportunities	65	4.11	.89
Quality software	65	4.10	.77
Support for other teachers	65	4.03	.77
Proper connections	65	4.01	.78
Time to let students use technology	65	3.95	.87
Resources (funding, equipment, etc.)	65	3.94	.83
Physical classroom structures	65	3.76	.98
Mobile equipment (laptops, etc.)	65	3.75	.71
Time to plan for technology implementation	65	3.64	.99
Support from parents	65	3.60	1.08
Smaller class sizes	65	3.18	1.11
Valid N (listwise)	65		

Table 8.4

Likelihood that these factors will occur at your school - teachers

	N	M	SD
Access to the Internet	475	4.30	.83
Technical support (technician)	474	4.00	.94
Support from school administrators	477	3.95	.89
Quality software	476	3.85	.92
Support from other teachers	477	3.78	.81
Professional development opportunities	480	3.66	.94
Resources (funding, equipment, etc.)	479	3.47	1.02
Proper connections	478	3.45	1.05
Support from parents	476	3.43	.93
Mobile equipment (laptops, etc.)	478	3.35	.99
Time to let students use technology	477	3.33	1.07
Physical classroom structures	479	3.14	1.17
Time to plan for technology implementa	472	3.01	1.10
Smaller class sizes	474	2.73	1.21
Valid N (listwise)	442		

Level Two Analysis

In order to determine if there was a significant difference between the responses of the school leader participants and the responses of the teacher participants for the variables in either the survey sections regarding beliefs of the degree that a factor will enable effective technology use or the likelihood that the factor will occur at the school, a MANOVA (Multivariate Analysis of Variance) was run on the individual variables and then on grouped categories for each section. The Alpha level was set at .05 each time.

The MANOVA on the first set of the 14 variables related to enabling beliefs for the difference between school leaders and teachers found significance [F (14,511) = 3.88, p <.001, Partial Eta Squared = .096, power = 1.00]. However, there was only one statement where there was a difference approaching significance using follow-up statistical tests at the alpha = .001 level. This was "smaller class sizes" [F (1,524) = 9.03, p =.003, Partial Eta Squared = .02, power = .85.] For this question the leaders had a mean response of 4.1 (SD = .89) while the teachers had a mean of 4.4 (SD = .86). Since there was no further significance found in this section, no further analysis was completed on the 14 variables related to enabling beliefs. Statistical analysis determined that both groups were in basic agreement as to beliefs about these enabling factors for technology integration.

The MANOVA on the second set of 14 variables related to likelihood beliefs for the difference between school leaders and teachers was significant [F (14,491) = 2.83, p <.001, Partial Eta Squared = .075, and power = .998]. In this section of the survey, there were eight variables with a statistically significant difference between school leaders and teachers using follow-up statistical tests at the alpha = .001 level. These variables were resources (funding, equipment, etc.), professional development opportunities, physical classroom structures, support from school administrators, time to plan for technology implementation, time to let students use technology, mobile equipment (laptops, etc.), and proper connections. See Table 9 and Table 10 for further details on these results.

Table 9

Means and standard deviations for variables from the survey section concerning "the likelihood that these factors will occur at your school"

	Group	M	SD	N
Resources (funding, equipment, etc.)	Leaders	3.94	.83	64
	Teachers	3.43	1.04	442
	Total	3.50	1.02	506
Professional development opportunities	Leaders	4.11	.89	64
	Teachers	3.64	.96	442
	Total	3.70	.96	506
Physical classroom structures	Leaders	3.77	.99	64
	Teachers	3.09	1.17	442
	Total	3.17	1.17	506
Support from school administration	Leaders	4.39	.61	64
	Teachers	3.93	.91	442
	Total	3.99	.89	506
Time to plan for technology implementation	Leaders	3.64	1.00	64
	Teachers	2.99	1.10	442
	Total	3.07	1.10	506
Time to let students use technology	Leaders	3.95	.88	64
	Teachers	3.29	1.07	442
	Total	3.38	1.07	506
Mobile equipment (laptops, etc.)	Leaders	3.75	.71	64
	Teachers	3.32	1.00	442
	Total	3.38	.98	506
Proper connections	Leaders	4.02	.79	64
	Teachers	3.40	1.05	442
	Total	3.48	1.04	506

Note: statistically significant difference found using follow-up statistical tests at the alpha = .001 level

Table 10

MANOVA results for variables from the survey section concerning "the likelihood that these factors will occur at your school"

Statement concerning belief about likelihood the factor will occur at your school	*F*	*p*	Partial Eta Squared	power
*Resources (funding, equipment, etc.)	(1,504) = 13.81	*p* <.001	.03	.96
Professional development opportunities	(1,504) = 13.97	*p* <.001	03	.96
*Physical classroom structures	(1,504) = 19.60	*p* <.001	.04	.99
Support from school administrators	*F* (1,504) = 15.50	*p* <.001	03	.97
Time to plan for technology implementation	*F* (1,504) = 20.07	*p* <.001	.04	.99
*Time to let students use technology	(1,504) = 21.98	*p* <.001	.04	.99
*Mobile equipment (laptops, etc.)	(1,504) = 11.01,	*p* =.001	.02	.92
*Proper connections	(1,504) = 20.62	*p* <.001	.04	.99

*Levene's test was significant at p < .001 level.

A categorical MANOVA was also run on grouped categories of the survey variables. For the grouped categories, the two sets of 14 variables in the survey identified as support factors were sub-divided into four of the five conceptual categories of support

needed to integrate technology effectively as identified by the pilot study and the literature review (Appendix B). These conceptual categories were general administrative support, professional development opportunities, access to appropriate resources, and establishment of a school vision or culture.

For the first categorical MANOVA test, the four conceptual categories were run separately for both school leaders and teachers for enabling beliefs. For this test, the results found no overall significance [F (4,548) = 5.54, p <.001, Partial Eta Squared = .04, power = .98.] Box's M was not significant nor were the Levene's test statistics for the follow-up test. Mean substitution was used to replace missing values when calculating these factors. Further follow-up tests revealed that only "professional development opportunities" had significantly different means between the school leaders and the teachers [F (1,551) = 8.17, p =.004.]. This result of little significance verified the earlier findings of no significant difference between the school leaders and the teachers concerning the factors that will enable one to effectively use technology. See Table 11 and Table 12 for further detail.

Table 11

Means and standard deviations for "Degree to which you believe each factor will enable you to effectively use technology."

	Group	M	SD	N
General Administrative Support	Leaders	4.46	.63	66
	Teachers	4.33	.72	487
	Total	4.35	.71	553
Professional Development Opportunities	Leaders	4.40	.93	66
	Teachers	4.05	.92	487
	Total	4.09	.93	553
Access to Appropriate Resources	Leaders	4.32	.57	66
	Teachers	4.38	.63	487
	Total	4.37	.63	553
Establishment of School Vision/Culture	Leaders	4.06	.62	66
	Teachers	4.12	.63	487
	Total	4.12	.62	553

Table 12

Means and standard deviations for "Likelihood that these factors will occur at your school system"

	Group	M	SD	N
General Administrative Support	Leaders	4.12	.56	66
	Teachers	3.66	.73	487
	Total	3.71	.73	553
Professional Development Opportunities	Leaders	4.10	.88	66
	Teachers	3.66	.94	487
	Total	3.71	.94	553
Access to Appropriate Resources	Leaders	4.01	.48	66
	Teachers	3.59	.75	487
	Total	3.64	.73	553
Establishment of School Vision/Culture	Leaders	3.69	.59	66
	Teachers	3.32	.72	487
	Total	3.36	.72	553

The MANOVA test was then run for both school leaders and teachers for the likelihood beliefs. Significant results were found this time, with the school leaders being significantly more optimistic than the teachers that these factors will occur [F (4,548) = 6.69, p <.001, Partial Eta Squared = .05, power = .99]. Box's M was also significant (p = .002). Follow up tests revealed that differences in all four conceptual categories of support were statistically significant at the p = .001 level. Although the differences were small, they were real. Table 13 gives more detail of the results.

Table 13

MANOVA results for "Likelihood that these factors will occur at your school system"

Statement concerning beliefs about likelihood the factor will occur at your school	*F*	*p*	Partial Eta Squared	power
General Administrative Support	(1,551) = 24.09	*p* <.001	.04	1.00
Professional Development Opportunities	(1,551) = 13.00	*p* <.001	.02	1.00
*Access to Appropriate Resources	(1,551) = 19.55	*p* <.001	.03	1.00
Establishment of School Vision/Culture	(1,551) = 15.69	*p* <.001	.03	1.00

*Levene's test was significant at p < .001 level.

Question Analysis

Phase One of this research sought to answer the following question:

Is there a difference between the school leaderships' beliefs concerning support factors that affect technology integration and teachers' beliefs concerning support factors that affect technology integration?

Analysis of the data indicated that there was a significant difference between the school leaderships' beliefs concerning support factors that affect technology integration and teachers' beliefs concerning support factors that affect technology integration, especially those beliefs related factors that were likely to occur in the schools.

The sub-questions for the survey section concerning the "Degree to which you believe each factor will enable you to effectively use technology" were the following:

1. Is there a difference between the school leaderships' beliefs about the provision of general administrative support for teachers and the teachers' beliefs about the provision of general administrative support for teachers?

2. Is there a difference between the school leaderships' beliefs about the provision of professional development opportunities to increase knowledge about computers and integration and the teachers' beliefs about the provision of professional development opportunities to increase knowledge about computers and integration?

3. Is there a difference between the school leaderships' beliefs about the provision of access to appropriate resources and teachers' beliefs about providing access to appropriate resources?

4. Is there a difference between the school leaderships' beliefs about the leaderships' establishment of a school vision and/or culture for integration and the teachers' beliefs about the leaderships' establishment of a school vision and/or culture for integration?

Results of the different statistical tests run on these questions indicated that for beliefs about the "Degree to which you believe each factor will enable you to effectively use technology," there was no significant difference between the school leaderships'

beliefs and those of the teachers in three of the four questions: Number 1 concerning general administrative support; number 3 concerning provision of access to appropriate resources; and number 4 concerning the establishment of a school vision and/or culture for integration. There was a significant difference between the school leaderships' beliefs and the teachers' beliefs in question two concerning the provision of professional development opportunities to increase knowledge about computers. Therefore, for the enabling factors beliefs, the answers for questions 1, 3, and 4 were no and question 2 was yes.

The sub-questions for the survey section concerning the "Likelihood that these factors will occur at your school system" were the following:

5. Is there a difference between the school leaderships' beliefs about the provision of general administrative support for teachers and the teachers' beliefs about the provision of general administrative support for teachers?

6. Is there a difference between the school leaderships' beliefs about the provision of professional development opportunities to increase knowledge about computers and integration and the teachers' beliefs about the provision of professional development opportunities to increase knowledge about computers and integration?

7. Is there a difference between the school leaderships' beliefs about the provision of access to appropriate resources and teachers' beliefs about providing access to appropriate resources?

8. Is there a difference between the school leaderships' beliefs about the leaderships' establishment of a school vision and/or culture for integration and the

teachers' beliefs about the leaderships' establishment of a school vision and/or culture for integration?

The analysis of the conceptual category for the "Likelihood that these factors will occur at your school" did find a statistical significance in the difference of beliefs between the school leaders and the teachers in all four questions. The school leaders believed that these factors related to support that can effect technology integration were more likely to occur in the schools than did the teachers. Therefore, for the likelihood factors beliefs, the answers for questions 5, 6, 7, and 8 were all yes.

Since a statistical difference between school leaders and teachers was found in the likelihood beliefs and not enabling beliefs in this phase of the study, the final analysis was conducted on likelihood beliefs only. Group statistics were run on the individual schools in order to identify the schools in which the difference was greatest between the likelihood beliefs of the school leaders and the teachers. Using the means of total scores for the responses given for the 14 variables by all participants at each school, one high school, one middle school and one elementary school were identified as the extreme cases as they had the largest statistical difference between school leaders and teachers. Interview participants for Phase Two of this study were selected from the schools identified by this analysis. Table 14 gives detailed data on the selected schools which are identified here by school level only.

Table 14

Group statistics for schools identified as having the largest difference in likelihood beliefs between school leaders and teachers.

Role	N	M	SD	Std. error mean
High School Teachers	22	43.95	7.11	1.51
High School Leaders	5	51.27	9.25	2.78
Middle School Teachers	32	48.65	10.15	1.79
Middle School Leaders	5	57.00	3.31	1.48
Elementary School Teachers	18	48.22	7.60	1.79
Elementary School Leaders	3	59.50	7.42	3.70

Summary

This chapter presented the results of the data analysis for Phase One of this study. Initially, the data were analyzed for mean values and standard deviations in the beliefs concerning support factors that affect technology integration between school leaders and teachers by each of the fourteen independent categories. This provided descriptive data from the sample population. The mean and standard deviation was run for the total group of participants, then again for the sub-groups of school leaders (including Instructional Technology Specialists) and teachers.

Subsequently, a MANOVA was run on the individual variables and then on the grouped conceptual categories for each section. This was done in order to determine if there was a significant difference between the responses of the school leader participants and the responses of the teacher participants for the variables in either of the survey

sections regarding beliefs that a factor will enable effective technology use or the likelihood that the factor will occur at the school.

Results on the differences between school leaders and teachers beliefs concerning "Degree to which you believe each factor will enable you to use technology effectively" were significant. However, only one variable concerning "smaller class sizes" had a difference approaching significance using follow-up statistical tests. Since there was no further significance found in the enabling beliefs, no further analysis was completed on those variables. Results on the second set of variables for the differences between school leaders and teachers concerning the "Likelihood that these factors will occur at your school" were significant. In this section of the survey, there were eight variables with a statistically significant difference between school leaders and teachers using follow-up statistical tests.

A categorical MANOVA was also run on grouped categories of the survey variables sub-divided into four of the five conceptual categories of support needed to integrate technology effectively. Analysis for the "Likelihood that these factors will occur at the school" indicated a statistical significance between the school leaders and the teachers in all four questions, with the school leaders believing that these factors were more likely to occur than were the teachers. Group statistics were used to select the schools in which the difference was greatest between the likelihood beliefs of the school leaders and the teachers. One high school, one middle school and one elementary school were identified as the extreme cases and the interview participants for Phase Two of this study were selected from these schools. These schools will be anonymously identified as North Elementary School, Central Middle School, and West High School. The contextual

description of the school system and individual schools, along with the individual case analysis and the within-case analysis, will be presented in Chapters Five, Six and Seven.

CHAPTER FIVE

CASE FINDINGS - NORTH ELEMENTARY SCHOOL

The purpose of this mixed methods case study was to investigate the beliefs of school leaders and the teachers concerning support factors that affect technology integration. It took place in a mid-sized suburban public school system located in the southeastern region of the United States of America. Phase One of the study consisted of a quantitative survey that was used to gather data on beliefs about technology integration and then used to identify extreme case schools, as reported in Chapter Four. To further define this study, interview participants for Phase Two were purposefully selected and included one leader (the school principal) and two teachers from each identified extreme case. Teachers were selected to represent a variety of grade levels, content areas, and years of teaching experience across all three case schools.

The qualitative interviews were conducted to address these questions:

5. What are school leaders' beliefs about the support role they play in teacher integration of instructional technology?
6. What are teachers' beliefs about the support role that school leadership plays in teacher integration of instructional technology?
7. How do school leaders describe the support they provide for teacher integration of technology in the classroom?

8. How do teachers describe the support they receive from school leaders for their integration of technology in the classroom?

The findings emerged from the data and are shared in three chapters. To introduce the reader to the participants and the context of the study, this chapter includes a description the contextual setting of the school system and a contextual description of the first extreme case, North Elementary School. Presented next are individual case findings derived from interviews, field notes and artifacts, and the chapter concludes with a within-case analysis of the beliefs of the teachers as compared to those of their school leader in each of the individual schools. Chapters Six and Seven provide the contextual setting, individual case findings, and within-case analysis for the other two extreme cases, Central Middle School and West High School, respectively.

Contextual Setting of the Eastland School System

In 1993, the leadership of Eastland School System decided that it was time to provide technology improvements throughout the system and began allocating both financial and personnel resources to support this initiative. In the 2004-2005 school year, Eastland School system revised their System Technology Plan to coordinate with the current state technology plan and new goals required by the *No Child Left Behind Act of 2001(NCLB)*. This act includes a recommendation that by eighth grade all students should be technologically literate and it repeatedly references technology as an important source of support for teaching and learning across the curriculum. As support to both national and state goals, the system technology plan document stated that the mission of the planning committee was "to provide direction, support and leadership for constructive use of technology in the educational process at school, home and throughout the

community; to provide professional development for school personnel; and to secure technological capabilities to accomplish these tasks" (p. 16). In addition, statements of the Technology Vision for the system were the following:

1. Learners will interact successfully with technology to achieve personal, system, and community goals.
2. Learners will become a part of our global community through enhanced communication ability and greater access to information resources.
3. Teachers' roles will change from traditional instructional delivery to coaching, monitoring, and verifying student achievement of learning goals.
4. All school and central office staff will work collaboratively to plan technology-enhanced and integrated learning experiences.
5. Parents, businesses, libraries, and community agencies will be a vital part of the technological communication pattern in the community.

In further support of these vision statements, the system employed a Director of Technology who managed the hardware, software, network, Internet, and infrastructure support, and an Instructional Technology Coordinator whose focus was on improving instruction through professional development opportunities and similar supports. In addition, a certified teacher position was provided at each school - the Instructional Technology Specialist (ITS). The ITS responsibilities included training the staff on equipment and software that is available to the school. From 2000 until 2005, most of the ITS time was spent providing staff development to teachers on technology use. During ht 2005-2206 school year, the ITS should spend the majority of their time helping teachers integrate technology into their curriculum. As new equipment or software was added, the

ITS provided training on how to use the new technology and how to integrate its use into daily activities. Also provided was a classified position known as an Intel whose main role was to supply support with hardware and network at the local school. Although these were the stated roles of these individuals, the school ITS and Intel could be given additional duties and tasks by the school principal at any time in addition to these.

There were approximately 4500 classroom computers in the school system. All of the classrooms had at least one Internet connected computer, each school has a computer laboratory and a mobile laptop cart, and there are numerous computers in the media center and office areas. Every employee had an email account and access to a computer. The wide area network (WAN) linked all office areas and every classroom to the central office databases and the Internet. A variety of software programs were also provided from the system level for classroom use, including current editions of Microsoft Office programs, graphic organizer software, an online encyclopedia, a grade book management system, and a test data analysis software.

Also offered was system-developed technology professional development course, a 50-hour state approved technology-integration course which led to the state-required technology proficiency certification for staff and administrators. Due to political pressure, in the spring of 2004 the PSC approved an online test-out option to be accepted by the state of Georgia as a method of meeting the technology proficiency required for teacher certification process. After reviewing this test, this system decided that this option did not adequately demonstrate that teachers had the skills necessary to integrate technology effectively into the classroom environment in ways that increased student achievement and motivation, skills that were deemed by system leaders as necessary to meet

instructional goals. Therefore, Eastland School System continued to offer professional development courses with the expectations that all teachers and administrators would complete this training or a comparable training, such as InTech or a state-approved college-level course.

At the time of writing, 90% of the system certified employees had completed the technology proficiency requirement. The overall LoTI Level for the system at the end of the 2006 school year was at a 3 which was described as a condition in which technology-based tools augmented selected teacher-centered instructional events and some higher-level cognitive processing may be taking place. The LoTI survey also indicated there was little or no need for additional professional development in computer use; however, there was a mid-level to high level need for professional development in areas related to technology integration into curriculum and instruction to address higher-level thinking skills. This signified there were still areas of growth that should be addressed in order to meet the system's vision of changing the teachers' roles from traditional instructional delivery to coaching, monitoring, and verifying student achievement of learning goals and using technology tools to enhance learning by raising learner productivity and improving problem-solving skills. (See Appendix F for details on results of the survey and descriptions of the LoTI framework.)

In the 2005 Southern Association of Colleges and Schools (SACS) Accreditation Review report, one recommendation was made to the system related to technology use. It stated,

> Current uses of technology as a teaching and learning tool should be analyzed and training provided to encourage regular use. Adequate provision of both hardware and software should be ongoing to enable technology to be an effective instructional tool (p.15).

This statement supports results and needs as indicated by the completed LoTI survey.

Contextual Setting of the School

North Elementary was located in the northern area of the county. Twenty-five years ago, this area was mostly rural. It opened in 1967 as the second elementary school in the system and has seen the area of open land, farms and mills change into sprawling subdivisions and the largest mobile home park in the southeast. In 2005 there were approximately 530 students in pre-kindergarten through 5th grades in this Title I school. The school had the highest Limited English Proficient (LEP) population in the system (29%) with 57% of students represented by the Hispanic race, 13% Black, 26% White, and 4% Multi-racial. The free and reduced lunch rate was at 76%, as compared to the system average of 40%. The school's mission statement reflected the changing student population: the mission of North Elementary is to equip students with knowledge, skills, and qualities required to meet the challenges of a constantly changing society and world. Forty-three certified teachers served this population, the majority of them White and Female. About half of the teachers had a Master's Degree, with the other half having a Bachelor's Degree with the exception of two teachers with Education Specialist's Degrees. Most of the teachers had taught for 10 years or less. There were two administrators at the school and both administrators were female, had Master's Degrees, and more than 30 years of experience in education.

In North Elementary there were approximately 250 computers with at least two computers in each classroom, each wired and networked with high-speed Internet access. There were two computer labs available for teacher and student use, each with at least 28

computers available along with an interactive white board and projector. There were three 21st Century Classrooms in the school which contain a laptop or desktop computer, an interactive white board, a projector, and a VCR/DVD player. One portable classroom had been converted into a technology lab, equipped with three large televisions, three computers, an interactive white board and a DVD player. Teachers had about five hours per week available for instructional planning that is not otherwise committed to meetings or parent conferences. The Instructional Technology Specialist was a former elementary classroom teacher and had been at this school and in this position for two years.

The LoTI level report for North Elementary indicated the faculty average was at a mid-level need for future technology integration professional development in most skill areas. The overall LoTI level was at 2, a condition in which technology-based tools were generally used to serve as a supplement to the existing instructional program. The level also identified a high-level need for using technology for complex thinking projects. In the 2005 SACS review committee report, one recommendation given to the school was "the school should expand school-wide availability to technology, investigate additional ways to use limited technology in the classroom, and upgrade technology as funds become available."

Pam Miles

The interview with Pam, a third grade teacher, took place in her classroom one afternoon near the end of the school year. All the children had recently left for the day, but the room was already neat and organized for the next day's activities. This class was set up as one of the three 21st Century Classrooms in the school, and the interactive white board was mounted on the wall in front of grouped student desks. A station of two

student computers made up one of several learning centers that were arranged, along with a reading space and a math manipulative area. It was evident that this was a warm and welcoming learning environment for the children in her class.

Pam was the youngest teacher interviewed and she was nearing completion of her fourth year in the classroom, all of which had been at North Elementary School. A self-professed lover of technology, she was young enough to have "come through school at a time when it (technology integration) was really starting to get big, and that's how I went through college and even in my last few years of high school." She also had taken a course in technology integration in her college education program. Her technology use attitude and competency had led to being selected as a teacher to pilot the interactive white board system in her classroom. As far as use in her own classroom, Pam thought that the interactive white board "was definitely my most effective use. You can do so many things with it. It's just an interactive tool. You can use it in every subject …" The students "think it's cool and they pay attention to it better. You can move things and do pictures and all kinds of things with that…." In addition to the board use, Pam also stated use that included the students being able to

> take reading counts tests on the computer. We have different games and things whenever we have center time or free time and so they use the computers freely. They know how to get onto the internet and they know how to do some things now.

Her interest in being innovative in her teaching and her enthusiasm for her students were evident throughout the interview.

Provision of General Administrative Support for Teachers

Overall, Pam believed that there was administrative support for the use of technology by teachers in the classroom, even though she really could not give a list of

specific actions that the principal or instructional lead teacher took to show that support. She stated, “I don’t ever really hear them say here or there about technology, but I do know that they do like it and do want our kids to experience it.” However, she saw the Instructional Technology Specialist as the true technology leader at the school, stating, “We have a wonderful technology specialist now. I would definitely say the last two years we’ve had complete support from our technology leader here.” Even though it was evident Pam admired both her principal and ILT professionally, she was very hesitant to be critical of them in any manner. Her belief that the ITS was the real technology leader at her school was reiterated when Pam spoke about the role the school leadership played in her personal technology integration practices. She stated,

> I think they [the school administration] are old school, and they don’t know so much themselves so they don’t really say too much about it, but they put a lot of their trust in our technology specialist - and they really do believe that it’s extremely important.

Pam saw herself as basically supported in her use of technology in the classroom, but she also had concerns about the level of support provided to other less proficient and self-motivated teachers in the school. The main emphasis for use and training throughout the school for technology use had been focused on administrative uses such as student information systems, grade books, and test data analysis which concerned Pam, who thought that more emphasis should be put on classroom integration and student use. She believed that even if the teachers did not have the interactive boards in their classrooms, all of the teachers should be pressured to use technology more with the students other than required administrative uses, stating,

> I think maybe sending them to some workshops or having a workshop here at a faculty meeting or something, especially some of the more veteran teachers that

> have been here a lot longer that are scared to turn the computer on because a lot of times that's what they strike out with.

In her perspective, the area of greatest need was provision of more time to learn about how to use and actually practice using the hardware and software available at the school. She felt the biggest support need was

> Time - and that's probably the answer you would get from everyone that you know. It's so hard that you've got to do this and you've got to do this and teach this and cover this and then have 10 minutes at the end of the day and you can use that 10 minutes for that, but I just don't have enough time to do as much as I'd like to do with it.

In general, Pam did believe there was support for teachers by the school leadership for technology use and integration in North Elementary. Nevertheless, this support could have been more clear and direct to the teachers and had not necessarily had a great affect on her. According to Pam,

> I don't know necessarily if the school leadership, meaning the principal and the ILT, I don't know if they necessarily affected my use of technology. Probably if anything it might be reversed … simply because I came through an era that used technology and they did not…

On the positive side though, she also believed that the principal did all that she knew how to and could, as she "continuously provided opportunities for me to go and observe and learn" as Pam requested these opportunities and "they work hard to at the budget meetings to try to help. She's asked for more ActivBoards® and asked for more things and they do what they can to get them."

Provision of Professional Development Opportunities

Professional development in technology use had been offered to and sometimes required for the teachers at North Elementary, including the local proficiency course. Although most of the teachers at the school had gone through the local program, Pam had

completed her proficiency requirement through college coursework in her undergraduate program and felt this had been beneficial, although revisiting would be helpful, "maybe something just to keep things fresh. I mean there are things that I've done but I've even forgotten - if you don't practice it you don't remember it." She also didn't have a lot of faith in the ability of teachers who had completed system course, stating "I know that the [course] is supposed to kind of help with that [technology use], but I don't know if it does, if it gives them enough instruction, or if it's more or less you're kind of doing your own work."

As far as school-based professional development for technology integration was concerned, Pam thought there needed to be an overall school plan in place but there was not one she knew of at the current time. There was some informal training that had taken place, for the school had "sent me to an ActivBoard® training and they had our technology specialist come in the afternoon to faculty meeting and present things to us." She believed more training was needed on technology integration as "our technology specialist has come and said 'let me show you where you can find this on the website' or whatever. But I wouldn't constitute that as a 'here's how you do this.'" Though she had received some training on the interactive white board, she noted that "I wasn't really trained with the ActivBoard® until probably after January of this year." She also felt that the school leadership could be more proactive in providing technology training to the whole staff because "they have sent us [teachers with interactive boards in classroom] to go and learn about the boards, but I don't think they've actually brought anything in here nor have they tried to educate those teachers that don't have the boards." Overall, in thinking about the professional development needs of the entire teaching staff, Pam

believed more was needed to address "the specific needs of teachers, even if they don't have an ActivBoard® or don't have certain things. I think maybe sending them to some workshops or having a workshop here at a faculty meeting or something would help."

Provision of Access to Appropriate Resources

Since Pam had one of the 21st Century Classroom equipment set-ups in her own room, she felt comfortable with the hardware access she had because it gave her "a step above everyone else" even though she didn't know she "was getting this room that had the ActivBoard®." Even though she only had two student computers in her classroom, she also felt that the overall access to computers was good, stating,

> We have a place to sign up on our computer [for the computer lab]. There's a schedule and we pick and choose dates and times that we want to go. So it's very much usually open. We have several cameras floating around the school - video cameras, any other type of equipment we're going to need.

She also believed the school leadership was trying to get more equipment for the school through budget requests to the central office.

Pam's main emphasis for support was based on the performance and activities of the school ITS. She believed that this ITS was "super, super wonderful" and that she was willing to help at all times and tried to be proactive with teacher-users, as she stated,

> You can call her in the middle of something, and she'll stop and come if she's not teaching a class, and she is very helpful, and she'll come to us and say, "Here, I know you do Georgia history and I know that you do the branches of government and here are some websites I found." We really don't have to ask her so much for help, and she just kind of presents stuff to us.

She also felt the ITS tried to provide instructional support whenever she could, as Pam emphasized,

> And she's always willing when we go into the computer lab as a whole class to come in with us and not necessarily teach the whole lesson, but have two bodies in their rather than one helping them get where they need to get.

Additionally, Pam thought the ITS tried to provide individual training and assistance to teachers who wanted it, as she was "constantly trying to find new things for us to do in our classrooms - and she'll find things for us and present those to us." It was clear that Pam felt that the school ITS was the main access to support for the teachers at North Elementary.

Establishment of a School Vision and/or Culture for Integration

Although there was a "feeling" that using and integrating technology in the classroom was important at North Elementary, Pam could not give any type of clear vision statement to support that feeling. As far as her personal vision went, Pam said,

> I think it's wonderful… it gives kids a chance to see what they're going to be doing in the real world, and even though we are in a classroom and they may all not be teachers, they're going to have to have some knowledge of computers and internet and how to use those things.

As part of her personal vision, Pam believed that technology use in the classroom had an affect on student achievement as part of an overall view of having high student expectations. She stated,

> I teach in a school where demographics vary widely, but we have high expectations of our kids, and so I think this gives them a chance to want to achieve more than maybe what they're living in now - their current living situations - and so I think that technology does have a great big effect on achievement and I think they the children know that. I think they know the world outside of school is revolved around technology, whether it be cell phones or computers or anything like that.

Pam also believed technology had a positive affect on student motivation, possibly because the majority of these particular students had no or very limited access at their homes, and for them it was still "so colorful, so different." In fact, she believed the fact that a student could "type in one word and find out all kinds of information about one

specific topic, and I think that motivates the kids to want to learn when they can go to one specific thing, and they can just find anything they want to in the world."

Pressure and Incentives for Technology Integration

Pam did not believe there was any real top-down pressure or noticeable incentives for technology integration. She did not even know that she was going to be in a classroom with the technology access that she had before getting the room assignment, and she did not know of a specific process used to select her to be in that room. To her knowledge there was no detailed practice to observe lessons that integrated technology nor was integration considered to be part of the teacher evaluation process. As for the leadership making it a practice to request to observe technology-integrating lessons, she stated,

> I don't think so. I mean they have never from me. I can't speak for the whole school, but I don't think they have ever said, "Hey, let me come watch your ActivBoard® lesson. Let me come see what you're going to do with your technology and computers today."

Although there was a sign up process for using the computer lab, she did not know if "it is actually monitored." In defense of her leadership, she said that they definitely support use even though "what may be on their side is time constraints or whatever."

Participant Summary

Pam Miles had enough knowledge of computer use and instructional strategies to allow her to feel comfortable with using technology in her classroom, and her belief that its use was important was evident in her attempt to learn more and use the equipment she had been provided to the best of her ability. She recognized the need for additional

learning and growth for herself and her teaching peers, but that also there were some external restraints put on that growth due to time and budget restraints.

Pam believed there was basic overall support from the school principal and ILT for technology integration, but those support factors did not have as large of an influence on her behaviors as did her own knowledge, values and beliefs about technology. Though Pam stated her belief in the importance of technology integration, her actual practice was often limited by specific training that she felt she needed, time to practice and plan use, and the need for more knowledge and practice with what had been provided to her.

Other teachers who were not as knowledgeable or had the positive attitude that she had concerning integration needed more pressure and support than she did, and she did not believe the school leadership was providing it to the extent and specificity it was needed. The main leadership support for the school came not from the administration but from the school Instructional Technology Specialist, a position that is basically a teacher position as opposed to an administrative position.

Tamara Cates

Tamara's interview was held in her fifth grade classroom shortly after her class was dismissed for the day. Even though it was the last week of the school year and the last week of the students' elementary school career, the room remained decorated and bright with motivational posters mounted on the walls and student work proudly displayed on the bulletin boards. The room was neat and logically organized to enhance the learning experience of the students who filled the room every day. This room was also set up as a 21st Century Classroom with grouped student desks placed strategically in front of the interactive white board mounted on the side wall. The two student computers

were on the opposite side of the room, against the wall and facing away from the student desks. On the teacher desk was a laptop computer that Tamara used both in her classroom and at home to prepare her lessons.

Tamara currently taught all subject areas except social studies for her fifth grade students. She and her team mate exchanged students for science and social studies. Math was her favorite subject to teach. She had taught for eight years, all of which had been in this system and also at North Elementary. She had completed the system technology proficiency course a couple of years before, and she used the skills she learned from that course and from her own exploration to achieve recognition as the "Outstanding Technology-Integrating Teacher of the Year" for her school in 2005. She believed that technology in the classroom was both important and inevitable, stating,

> I think technology integration is very important, if nothing else but to capture students' attention. I think they are immersed in technology from TV on, and in order to continue to capture their attention in the school we're going to have to embrace that and integrate it into our school day. I know in my job I use technology all the time even independent from the student - e-mail, that sort of thing.

Tamara saw the interactive white board as her most effective use of technology in her classroom "because it's something that I can easily prepare for ahead for the students" and could use "in conjunction with textbooks but with other materials as well." Using the board for whole group activities was "more time effective and more efficient" because "we can be doing things up on the ActivBoard® at the same time that I would not particularly want computers and laptops around for." She used the interactive board for whole class and small group instruction, for demonstration purposes, and for interactive projects such as Webquests. Her saw her greatest use of technology in her science classes although "the more I see myself integrating it into something like the

reading program, and the more motivation I do see out of my students." In addition to the interactive board, Tamara occasionally used the laptop labs in her classroom and also took her students to the project computer lab where "they're all able to use it (technology) at one time and students can work independently on one computer." It was evident throughout the interview that Tamara felt using technology in the classroom was important and she was very willing to share her thoughts and beliefs on the subject.

Provision of General Administrative Support for Teachers

In relation to the general support provided by the school administration, Tamara felt that the most important role of that support was related to financial support. This included funding new purchases and determining budgetary issues concerning "how much money we can spend on maintaining the technology we currently have, how it's going to be funded, and for teachers to go even outside the school system and get training on technology." Although she believed that the school leadership wanted technology to be integrated "throughout [the school] in order to do things like raise student achievement and definitely increase student motivation," she also felt that there was a need for an "overall plan for the school, especially when you're talking about staff development and having enough planning time for the individual teachers."

Tamara also stated that although she thought the school leaderships' vision of integration throughout the curriculum was addressed in the school mission, in reality the mission statement addressed promoting student achievement in general terms only; in no place was technology integration directly mentioned. This contradiction was reiterated as she stated,

> However, on the daily use side of it, sometimes I think it gets set to the side because there are so many other checklist items that have to be addressed, even in

> the budget. So again the school leadership helps determine how some of that money gets spent, and although they might not see it as directly affecting our daily use of technology, it does.

Tamara also felt that providing additional planning and practicing time for technology use was "critical" as she believed "if we had a little more planning time, so teachers who are a little more reluctant to use technology might use it more." She continued with

> One thing that I would really like to see is more planning time because I do think that is key to getting teachers to use the technology more. I truly believe that nobody gets used to technology and nobody gets comfortable with it unless they use it. And sometimes you have to use it independently before you are willing to get up and do it in front of students.

In general, even though it was not specifically stated in a written statement or outlined in a particular school-wide plan, Tamara believed her leadership was in support of technology integration in the school through their general behaviors of support to those teachers who wanted to implement integration - they helped when they could and did not hinder those who were innovators.

Provision of Professional Development Opportunities

Professional development in technology use had been offered to and sometimes required for the teachers at North Elementary, including the local proficiency course which Tamara had completed two years earlier. Although she felt that these local courses had met a need at the time, she thought "professional development for improving technology integration in and of itself ... it doesn't appear to be a priority in our staff development now." The current technology training available at the school focused on programs that were teacher-centered and administrative in use and "less on integrating it into the school." She continued with

> I don't know how it works at other schools but our staff is integral in determining the staff development plan. So if it's not used by the staff that's not going to be

> put on the top of the priority list certainly. Now with that said, I do think sometimes you have to - I think the leadership has to open the door and invite people to come in sometimes by requiring them to take certain courses and certain staff development hours.

The idea of seeing model lessons in technology integration was appealing to Tamara, especially with the leadership providing "substitutes to come into the classroom so we can go visit other teacher's classrooms to see what they are doing within our own school." Tamara had previously had an opportunity to assist in a technology integration presentation at a local university and found that "it definitely was a very positive experience to go outside the school system to see what other systems and other teachers are doing." She believed that part of the professional development provided should be "seeing model classrooms and seeing model lessons," emphasizing the importance of modeling by stating,

> I've rarely seen actual lessons happening in the classroom with the interruptions, with the server going down, with behavioral issues. How it's really utilized in the classroom - I think that would be really good. How do you take a webquest which you put all this time into planning? How do you make that happen in a classroom where you've also got this huge curriculum to teach? How do you balance that out? How do you pace it with other teachers? Just knowing how that works, seeing a model of how that works in another school or even in another grade level, I think would be really good.

It was her belief that "we're going to have to have more staff development to show people the possibilities" because "for the most part technology is not a cornerstone most of the time. I think it probably should be more. We have resources that are underused and underutilized. There are still not enough people." She emphasized again the need for more teachers to be technology integrators and users, and thought this should be addressed through required professional development, stating,

> So I really think we need more people trained in using something like an Interactive white board like the ActivBoard®, even if they don't have it in their

> classroom. I think to see the power of it if you have it available where you can go to use it once a month or once a year but to use it with your students. You're not going to go use it if you don't know the power of it.

Provision of Access to Appropriate Resources

Since her classroom was considered one of the 21st Century Classrooms with the interactive white board, projector, and her teacher laptop computer in addition to two student computers, Tamara felt that she had better hardware access than most of the other teachers in her school. However, even with this high-end equipment in her room, she also believed that "access for me is becoming limited only because the technology is beginning to age based on the amount of use it's had." For example, she enjoyed the student access that the laptop lab could provide in her classroom but lately when she wanted to implement those in her lesson, she discovered,

> We'll go in to use the laptop lab, and instead of 13 or 15 computers, there will be nine there. We have no way of knowing that ahead of time. So if we had a lesson that we planned and we're going to put two kids per computer – well, if I've got 12 or 13, I'm ready for that, but putting three or four kids on a computer is not the same thing. It's just sometimes it throws in some roadblocks that are hard to deal with when you're in front of students and trying to maximize your educational time.

She did like having one-to-one computing available in the school project lab where the students could "really show their creativity individually." She preferred that structure over having a set of two or four computers in her classroom because she did not like "trying to shift kids all the time. That just does not work as well for me as an individual." She also had some concerns about the continuing access to her board and projector because "there is not money available to replace the light bulb and the projector, and I'm afraid it's going to go out, and if it goes out, I'm going to be very upset." She continued her thoughts about access by stressing "the actual physical hardware that we can use is

critical because if you don't have enough sharing just isn't always possible, not when you're trying to maximize the time in the school day."

Support in the form of the Instructional Technology Specialist and the Intel (technology-skilled paraprofessional) was considered very good. Tamara felt they were very flexible, very helpful, and liked the fact "they'll talk to me on my level, not over my head." She also thought these support people were focused on helping the teachers and students, explaining,

> If I have something as simple as my projector on but the board's not working, they will drop if at all possible what they're doing and come help me at that point in time. And I don't know how you could ask for more support than that.

She also noted that the ITS provided information to the teachers on additional and outside professional development opportunities and experiences the teachers could participate in if they chose to do so.

Establishment of a School Vision and/or Culture for Integration

Although Tamara stated that using and integrating technology in the classroom was important at North Elementary, she could not give any type of clear vision statement to support that statement. From her perspective the school vision was to "integrate technology into all areas of curriculum as much as possible and to make it useful within the state curriculum so its not technology for technology sake." The purpose was not to simply teach software programs for the sake of simply knowing how to use a program, but they were "teaching them how to use it at the same time and how it might be useful in the outside world." Her personal beliefs were congruent to this vision as she believed her students should use technology in the classroom now so eventually they could "be

effective at their jobs…hopefully in the future they're going to have to have some of those things.

As far as the effect of technology integration on student achievement was concerned, Tamara "instinctively" felt like it was helping student achievement, but countered with "I really don't have clear data and that's what I'd like to have - some clear data that says that students are doing better because of this." However, her instinct was also supported with the knowledge that "for the first time in a while I can look at all the students in this homeroom and say you're going to go to 6th grade. I don't have anyone being retained. I believe it's four [students] being placed which is actually very good considering what it has been in the past."

Tamara believed the culture of the school did support those teachers who wanted to integrate technology into their classroom instruction but did not require those teachers who were not comfortable with that instructional model. The actions of the school leadership were seen as supporting a vision of technology integration in general through providing opportunities and support to interested teachers and not holding them back as they tried the new instructional models.

Pressure and Incentives for Technology Integration

Although Tamara believed in and practiced technology integration in her instruction, she did not think there was specific pressure from the school leadership that directly influenced her practice. She did not know if teacher use was truly monitored; although, she had been told by the ITS that when a teacher signed up to use the different technology and labs in the school "there's a record kept of that just to monitor the amount

of use of different things like the laptop lab or the projects lab, but to evaluate individuals on - I don't know that they do."

Although she did make it a practice to design lessons that used technology, she did not write such plans because it was an expectation of the school leadership to include technology in her lessons, nor did she make it a specific practice to address technology standards in these plans. She felt "that some of those [integration] standards are met. I think it's wrapped into some of what we're doing, but they are not really being met in a direct way in this classroom."

She did believe the school leadership made it a point to observe technology-integrating lessons, at least with her. In fact, her only observation for the year had been planned around her use of the interactive board because "they wanted to make sure that they came in and saw a time when I was using the ActivBoard® and we were using laptops." She let them know ahead of time that being observed while using the technology was "something that I'm willing to do" and she provided the times she might be using it so "they could choose a time if they wanted to come and see it because that's what made it comfortable."

Participant Summary

It was clear that Tamara was comfortable with her knowledge of personal use of the technology software and hardware provided to her at school and that she thought use of technology was an important skill to develop in both teachers and students. Her belief of this importance was partially evidenced by her selection by the school leadership to have the additional hardware in her classroom, as well as by her status of the Technology–Integrating Teacher of the Year award for her school. Her value of and

positive attitude toward technology integration was further evidence by her recognition that she still had room for growth in her integration skills in regards to her classroom instruction, and by her desire for more professional development for integration to be provided to her and the other teachers in the school.

It was clear Tamara believed her school leadership was in support of technology integration and that they were making efforts to show that support. Although she felt the school leadership believed technology integration was important for the school, direct actions that affected the entire teaching faculty were not evidenced as strongly as she felt they could be. She believed the support was lacking in some areas, such as planning time and equipment, though she attributed some of that lack to budget restraints beyond the leadership's control. The access to equipment was the type of leadership support that most influenced her use at this time as it furthered her ability to support her value of integration and use in the classroom.

Tamara felt that more time to plan for her technology integration and more professional development to further her classroom integration skills were areas of lack of support that hindered her abilities at this time. She recognized that other teachers in the school were below her level of use and integration, and she wanted to see more pressure put on these teachers to get additional training and more equipment provided to those teachers to use. The most specific support for classroom use came to the teachers via the ITS and Intel, but they could only assist those who were already interested and wanting to learn, not make any requirements of the teachers. So although technology integration seemed to be expected by the leadership, the teaching behaviors of all individuals in the school did not always reflect that implied expectation.

Holly James

Holly James was the principal of North Elementary School. The interview took place one early afternoon two weeks after school was released for the year and the teachers had left for the summer break. The school was being painted and the odor of the paint permeated the building. Holly was retiring as of June 30 after 32 years in education, and she was busy cleaning and packing up her personal belongings when the researcher arrived at the school. It was obvious that retirement from her life's career in education was a mix of joy and sorrow for Holly as she briefly described several objects of memorabilia scattered across open boxes. The interview took place at a small table just outside Holly's office because it was the only place available with chairs. Holly apologized several times for the condition of the space, but the disarray did not interfere with the interview process at all. As she was the only person working at the school that day, the interview was interrupted a couple of times by phone calls that could not be put off for later.

Holly had been at North Elementary for 27 years, 14 years as a teacher, eight years as the Instructional Lead Teacher, and five years as the principal. This year she had been recognized by the state of Georgia as a "High Performance Principal" which indicated her school showed higher than expected scores on state Criterion-Referenced Competency Tests (CRCT) in four of five subjects assessed in elementary or middle school (Reading, English/Language Arts, Science, Mathematics and Social Studies). She was the only recipient of this recognition in this system. Holly had witnessed the school population and demographics make a radical change in recent years, moving from mostly rural and white to more urban with the highest Hispanic and ESOL population in the

system. She sang praises for her school's students and parents saying that they were some of the "sweetest children" and "most appreciative" parents with whom she had ever worked. She recognized that this population could present a set of unique challenges for the teachers, but that the teachers there described this job as many of the Peace Corps volunteers did theirs – "the hardest job you'll ever love." The low teacher turnover rate further emphasized this perspective. Although she felt she was not the "most technology competent principal in the system," she was very open and enthusiastic in her interview participation.

Provision of General Administrative Support for Teachers

Even though Holly did not see herself as particularly adept and proficient at technology use herself, she believed it was important for the students to be exposed to and use technology as it would be a big part of their future. As she explained,

> As foreign as it was for me to start this midway through my career and starting to even use all the technology, I know that our children have to have it, and when you see the little ones coming in, they already are more technologically savvy than I was as an adult, so its extremely important that we use technology in the classroom so that our children are successful as workers when they are adults.

Holly believed a major part of her support role was to ensure that the equipment needed by the teachers was procured by the school whenever possible. She stated that there were some things that she could do to "push that along so that we acquire more computers and that teachers know that I value it, and a lot of times that is a motivator for them to include those things in the lesson plans." Although her budget requests for more equipment was not always approved, she still acknowledged,

> I still think that as a leader you have to show that's one of the things that you want. It's not way down on the list of things, it's one of the things that's way up here, and we don't need to lag behind. We need to stay current with the technology that we have and I think we're doing that.

She also saw it as her role to open the school doors to assistance from external experts, such as the university-based trainer (and former school employee) who came twice a month to work with a small student group on writing web logs. She also supported a school-business partnership that allowed a monitored email exchange between selected students and employees to discuss current events. As she summarized, "I think by opening up the school to those kinds of projects, that's my role in seeking out some things where the children will effectively use the technology that we have." In addition, she supported individual teacher's initiatives with technology integration, especially those that involved higher-level thinking projects, presentations, and cross-grade level activities because "it establishes a community effort, but it also lets the children and the teachers know because I provide those opportunities that I value." Holly currently saw the most effective use of technology in the classroom to be research projects and student presentations, especially at third, fourth and fifth grades. Since the grade level teachers were provided with a joint planning time every week, she also believed the time needed for planning classroom technology integration was provided.

To ensure the professional development the teachers needed was provided was another priority in her view, as she stated, "I think that's one of the things that is pretty much number one - to provide the time so that they can have some training in using the different things." She felt it was important for teachers to see other teachers model use, especially with the new technologies. For example, she said,

> The ActivBoard® - that has peeked so much interest because it's in some of the classrooms and the other teachers would love to have it in theirs - they see it and they see somebody else doing it, and they're learning from that person because they're asking a lot of questions. So I think the access is already there but I think some training in all of those areas is necessary too.

Another support that she believed she provided was to get the right equipment to the right teacher because that was "the key - to get it in there with someone who will use it." She further elaborated,

> Because if you have these ActivBoards that are so expensive and somebody really isn't tuned in to using it, then it's not going to be as effective, but I think placing them in the hands of the right people, I think that's what we've tried to do at each grade level - to put them where we thought somebody was really going to use it so that the others that might be a little more reluctant. They see the value in it and then they want one too.

Holly saw her weakness as being able to model technology use to the teachers herself. Although she had learned quite a bit of the administrative uses such as required reports and data disaggregation, she felt she still had areas for personal growth because it was the "old" way of doing something that first came to her mind. She explained,

> I think that I need to use that [technology] even more than I have, and I see things - because I'm so used to doing it another way that sometimes it doesn't even occur to me that I could have saved myself a lot of time and parents; the communication would have been much better."

Overall, Holly believed the teachers knew she valued technology use in the classroom and that she wanted the use to be seamless, something to be used as a "tool" in the classroom.

Provision of Professional Development Opportunities

Like most of the elementary schools in this system, North Elementary had provided professional development time during and after the school day to enable the teachers to complete the state and local technology proficiency requirement. Those teachers who had not taken the opportunity to complete those courses during that time frame were expected to finish it on their own this past school year through the system professional development offerings. Holly also saw the ITS as a method of meeting the

professional development and training needs of the teachers by showing them technology strategies or ideas during a faculty meeting and "then if they're interested, going to small groups where - by grade level - to show them further about something." She saw this happening "at least once a quarter this past year." Holly required the teachers to attend the faculty meeting professional development and also participated herself because she thought if

> I'm not there it doesn't send a good message. Well, actually, it sends a message - it's just one I don't want sent. It's 'if I'm not there then it's not that important to me.' And it is important, and so I'm there and I want to learn as much as I can too, because I feel like if I don't know how to do these things then I can't convey to the teachers how important I think it's going to be for their students.

Although she felt the training that had been delivered in the school and system was good, she also thought

> The training that we have is not enough and on time - like finding all the reports and things. Sometimes I would like a follow up to those because I - when I get back to my computer I figure out how much I don't know, and I didn't know to ask some things during the training.

In addition to the organized professional development, Holly felt that many teachers could learn about and get motivated to implement technology integration by watching other teachers. This way the non or low users would "see other teachers are modeling that [technology use] and they see how much the children enjoy it, and how much the teacher enjoys using it because she thinks it's so effective, and because of that, they want to do it as well." Overall, Holly believed the professional development opportunities available for the teachers were sufficient to support technology integration and use in the classroom.

Provision of Access to Appropriate Resources

Holly believed that this school system and her school had "a lot to choose from" in relation to access to resources and that the support was there at both the system and school level. Part of this viewpoint was based on information she had received from friends who worked in other nearby systems and had told her they didn't have the same amount of material or personnel support as she had at her location. She was "very happy" with the support she had available, stating that she felt "very blessed to have and instructional technology specialist, Intel and all the technological support that we have from central office." Hardware such as computers, ActivBoards®, digital cameras, electronic buzzers, and projectors were available at the school, as were various types of software and a computer-based phone call system. She felt the "access was already there" and that one of her roles as a school leader was "to enhance the technology that we have" by requesting and providing for additional technology in her budget.

Holly also relied greatly on her ITS and Intel to provide information and assistance to the teachers and herself through providing assistance with maintenance of the current hardware and with instructional assistance and training. She also utilized outside resources such as the university representative to provide additional instructional support to technology projects in her school.

Establishment of a School Vision and/or Culture for Integration

Although it was not available in written form, Holly stated the school vision for technology use was "to integrate technology to the point that in each classroom teachers don't think of it as something in technology but just as an extension for lessons." She wanted the students to use technology as a "tool" for research and other classroom

activities because this was going to be a necessary skill for them to have in order to be "successful as workers when they are adults." She felt that "in the beginning when we first began to get computers, I think that you planned something on the computer or you planned something with an overhead - it was separate from your lesson." However, she now thought that they were now "headed in that direction" since "our teachers are really using it more as an extension of what's in their lesson plans, and it's not a separate part of it, it's integrated in the lesson plan."

Several times Holly mentioned the need for the students to be "thinking at a more critical level than just the basic knowledge" and being able to "to analyze and synthesize." She thought that technology could affect student achievement if they were able "to go to a higher level of thinking when they're able to use technology and put it all together." She mentioned the school-wide requirement that students watch a current events news program daily on the closed circuit television and then discuss this with the teacher and write about it to increase their vocabulary and writing skills. It was not required that students throughout the school to use computers for the writing process, although there was a 5th grade group that did discuss current events via writing on an Internet-based web log. This activity gave this small group of students a "real world stage" for their writing which would also improve their writing and communication skills. Student motivation was also affected by technology use because "that's one of the things they learn. They're very familiar with computers and video games and all those things so that's just in their comfort zone. I think it's a huge motivator when you allow them to do those things."

Pressure and Incentives for Technology Integration

Although Holly clearly believed the teachers in her school were integrating technology into their lessons, she had not required the teachers to include technology integration or technology standards to be noted in their lesson plans. The teachers met each Wednesday by grade level to do joint planning, and she felt that in these meetings technology use in their class assignments and projects "was part of that process." She also had not made her classroom observations "a point of going in for that specific purpose - to see if they are integrating it (technology)" although while she was "around and in and out of the classrooms" she saw "a lot of technology integration going on."

As far as evaluating teachers on their technology use, it was "more informal observations than it is a formal thing." She explained,

> When I go in to do the formal observations, I'm more tuned to what they are teaching, if they're covering the curriculum, how they're doing it. That's one more component of it, and I note that in their evaluations that this is a particularly good way to do something.

Holly watched and noted as she saw different technology integration lessons and projects being done in the classrooms, but she did not make integration part of her regular requirements as she made observations and evaluations. She also monitored the use of technology to identify the high users. She then provided those teachers with the new technology, such as the interactive white boards, because she believed "that's the key - to get it in there with someone who will use it… placing them [boards] in the hands of the right people..." was what would make the difference in inspiring others to be better users.

Participant Summary

Even though Holly knew her knowledge of personal use of technology was less than she felt it should be, she still professed the belief that use of technology and

technology integration were important skills to be developed in both teachers and students. She saw these areas as important knowledge for the students to acquire so they could be successful in the future schooling and careers. She was also a great believer in addressing higher level thinking skills with the students in all areas and of all abilities, which was as, if not more, important than how the curriculum was delivered, including technology integration.

Holly clearly believed she was supporting technology integration in her school, especially in the areas of providing access, instructional support, professional development, and weekly team planning time. She had a very positive attitude toward innovation and instructional technology use, and she supported those teachers who were interested in trying new hardware and software in their instruction by trying to provide materials and training they needed. Holly felt the faculty understood her vision of technology integration, and that they also knew she valued technology use and integration in the school through these leadership behaviors.

In Holly's opinion, the ITS, Intel and system level personnel provided ample support to the teachers as they moved toward classroom integration. By having those teachers on campus who were integration leaders model technology-centered instructional practices, Holly felt the less-proficient teachers were provided with motivation and some skills that would increase the practice of integration at the school. The ITS was also heavily relied upon to be a leader to the other teachers for the increase of effective technology integration throughout the school. She did not think it was necessary at this time for her to make requirements of all teachers to incorporate technology integration in their lesson plan writing or teaching observations.

Within Case Analysis

The guiding question of this study was "Is there a difference between the school leadership and the teachers in their beliefs concerning support factors that affect technology integration?" One fifth grade teacher, one third grade teacher, and the principal were interviewed at the first extreme case, North Elementary School. Differences and similarities in the beliefs and perspectives of support between these participants are discussed here.

Provision of general administrative support for teachers

All three participants believed there was general support for technology integration present at North Elementary; however, the beliefs of how that support was or was not enacted varied between the teachers and also between the teachers and leader. Pam saw the strongest aspect of leadership as the support and availability of professional development and the other assistance given to the teachers via the ITS whom she saw as representing the principal's support for integration. Tamara believed the strongest aspect of support was the financial support provided by the principal in acquiring newer and more hardware, and with funding additional professional development for interested teachers. Holly, the principal, also believed her strongest area of support was in the financial area.

All three participants saw time as general support concern but the teacher had opposing views. Pam and Tamara saw a need for more time during the school day to be provided so the teacher could learn more about the functions of the equipment available, especially the interactive whiteboards, and more time for planning technology integration lessons and actually practicing these lesson plans without students being present. Holly

had provided her teachers with joint planning periods during the school week and in contrast to her teachers, she saw that time as sufficient for the technology lesson planning.

Although Holly was forthright in her personal lack of comfort, confidence and ability to use technology, she believed the teachers knew she supported integration because when new equipment was available, she tried to match the high user teachers to the equipment and she also sought outside resources to provide additional support to her teachers and students. Both Pam and Tamara recognized the support efforts of Holly, but they also believed the stronger users received more support than the lower users. Pam and Tamara thought the leadership could be stronger by pressuring low users to take additional professional development and to use technology more on a regular basis, while Tamara thought that technology integration, while theoretically important, was not a "number one priority" in the school, and both teachers believed North Elementary needed to develop a school plan for technology integration professional development and planning time for the teachers.

Provision of professional development opportunities

All three participants agreed the professional development had been provided at North Elementary. Nevertheless, their reflection on the professional development activities provided at the school showed that the teachers and the leader had conflicting perspectives. According to the teachers, professional development had been made available, some required (the system and state proficiency courses) and some optional (various topics at faculty meetings); although, neither felt it was sufficient and had some question to its long-term effectiveness. In an opposing view, Holly felt the professional

development at the school had been very good and adequate to meet the teachers' needs and had attended all the professional development courses and occasions to show her support to the teachers. Although their overall perspectives were different, both Pam and Holly saw a need for more on-time training relevant to specific needs, whether it was new information or review of previous learning. Tamara thought the majority of current professional development focused too heavily on administrative uses and wanted to have more practical skills for integration provided but feared this would not happen in the near future as this was a low priority for most of the low-using faculty. Tamara also wanted more modeling of effective use of technology provided by other teachers so she could gain more knowledge, whereas Holly thought the modeling that was taking place in the school (by teachers like Tamara) was effective and met the school's needs.

Provision of access to appropriate resources

When looking at the access of appropriate resources at North Elementary, both teachers saw that access as good while the leader perceived the access as "excellent." Holly pointed out the high-quality support provided from the system level as she compared the technology materials provided in this system to other systems she knew of that did not have the same level of access. Neither teacher compared their school to other outside school systems. Both teachers had 21st Century Classrooms and recognized their access to equipment was better than most other teachers, and both also thought there was acceptable computer lab access, even though Tamara saw that access as becoming more and more limited as the current equipment aged. Pam felt that Holly was trying to find funds to acquire more hardware, which agreed with Holly's belief that her major role was to enhance hardware access. All three participants believed the school ITS provided good

personal support to teachers, and both teachers believed the ITS provided the main support for technology integration in the school, even above that of the principal.

Establishment of a school vision and/or culture for integration

There was no particular vision statement for technology available at North Elementary. When asked about the establishment of a school vision of technology integration, both Pam and Tamara stated that they thought the school leadership saw technology integration as basically important though it was not their highest priority. Holly also stated there was not a written vision statement for integration but she believed it was clear to the teachers that she supported technology. When reflecting on the school's vision as they saw it, Tamara felt the vision was to integrate technology into all areas and use technology as it would be used in "real life." This perspective was similar but not identical to that of Holly, who envisioned integrating technology as "seamlessly as possible" and using it as a tool in the classroom. All three participants believed technology was important because the ability to use technology would be important in the students' future job acquisition. Pam believed technology was a positive influence on both the achievement and motivation of students, while Tamara and Holly believed that although technology had a positive influence on motivation, a positive influence on achievement was possible but there was no evidence to support that influence.

Provision of pressure and incentives for integration

All three participants agreed that there were no specific behaviors of the leadership to pressure teachers to integrate technology into their lessons nor were there any specific incentives for classroom technology integration. They also agreed there was no requirement for teachers to write technology-integrating lesson plans to submit to the

leadership. Pam and Holly stated there was no required observation of technology use performed by the leadership, and Tamara believed her formal observation included her technology use because she was willing to be observed teaching such a lesson and she had the extra equipment in her classroom. Both Pam and Tamara thought that the computer lab use could possibly be monitored since one had to fill out a special sign-up form for use, but neither was sure or had any verification of that monitoring. Pam and Tamara knew of no evaluation requirement that included technology integration; however Holly stated she did evaluate technology integration on a more informal rather than formal basis and she made notes when she saw technology being used effectively in classroom instruction.

Summary

This chapter has included the contextual setting of the Eastland school system and of North Elementary School. The individual case finding of each interviewee were presented followed by a within case analysis of this school's participants. The data revealed that the school leader and the teachers at North Elementary seemed to have some overall similar beliefs about technology integration in relation to the main categories identified. However, the specifics of these beliefs within the categories identified differences, such as Holly's belief that she provided enough time for technology planning while the teachers believed there was a need for more. The next chapter will present the contextual setting for the second extreme case, Central Middle School, and the individual case and within case findings from that set of interviews.

CHAPTER SIX

CASE FINDINGS - CENTRAL MIDDLE SCHOOL

Purposeful sampling from a volunteer group was used to select teachers for participation in Phase Two of this study. The participants represented three different schools in the Eastland School System. The following provides the contextual setting of the second extreme case school, Central Middle School.

Contextual Setting of the School

Central Middle School was located in the center of the county, less than a mile from the county seat and the area that once was a bustling downtown business district. It was the oldest middle school having opened in 1978 after the original junior high was closed to be converted into the school system office complex. At one time on the state Needs-Improvement list for five consecutive years, in 2004 Central Middle had met adequate yearly progress in all areas as defined by the No Child Left Behind law and state and system goals. It has maintained this status for the past three years and was a Title 1 School of distinction for 2005-06 school year. The school mission statement posted in the school reflects this achievement philosophy: The mission of Central Middle School is to create an environment that ensures success for all students.

There were 1050 students enrolled in grades six through eight. The racial make-up of the school was 49% Black, 40% White, 8% Hispanic, 2% Multi-racial and 1% Asian. The free and reduced lunch rate was above the system level at 55%, and the

Limited English Population (LEP) is at 4%. The certified teaching staff at the school was more diverse than the system average at 30% Black and 70% White. The number of teachers with Master's Degrees was about equal to those with Bachelor's Degrees. The majority of the teachers had less than 10 years experience. There were three administrators, one with less than 10 years experience and the other two with 10-20 years in education. Two of the administrators had Master's Degrees and one had a Specialist in Education Degree.

In Central Middle there were approximately 375 computers, all networked with high-speed Internet access. All classrooms had a minimum of two computers and the majority of teachers have a laptop. There were four general use computer labs, one business education lab, one technology education lab, two math labs, and one inclusion special education lab. There were 8 interactive white boards with four of them being used as part of a 21st Century Classroom set up. Teachers had about four hours per week available for instructional planning that was not otherwise committed to meetings or parent conferences. The Instructional Technology Specialist was currently teaching a math class in addition to his ITS responsibilities and had been at this school for nine years and in this position for five years.

The LoTI level survey had not been taken by the Central Middle staff during the school year of this study even though it was a system expectation. The last time the staff here had completed the survey was the 2003-2004 school year. At that time the LoTI level was rated at a level 1. This was described as a condition in which the technology was used mostly by the teacher in the classroom, often for productivity tools, and student use usually consisted of non-content related work. It might be assumed that the level has

improved and is closer to the county average of a level 3 at this time, but there is no data available to verify that assumption. In the 2005 SACS review committee report, one recommendation given to the school was "consideration to expedite the completion of the third computer lab would enhance the instructional program of the school. Staff training will be necessary regarding the use of new technology." The third lab has since been completed and was in use.

Susan Jones

Susan met with the researcher one morning during her planning time two weeks before the end of the school year. The interview took place in her immaculately neat classroom that was decorated in a red and black, with the school mascot as a prominent theme. This was possibly the most organized and colorful middle school classroom the researcher had even been in, and it bore witness to the meticulous and detailed nature of this teacher. Susan, a former Central Middle School Teacher of the Year recognition winner, was very confident in her skills as a veteran teacher, and she spoke easily and confidently throughout the interview.

With a 22 year career in education, Susan was the teacher participant with the most classroom experience. During these years she had taught sixth through ninth grade students in the subject areas of language arts, reading, Georgia history, math, science, and French. Susan had been in this system and school for six years and had worked for three different principals during that time. She was currently the lead gifted education teacher for the school and taught gifted language arts to sixth, seventh and eighth graders. She had completed the state technology proficiency course through a professional

development program in another nearby school system before she came to the Eastland School System.

In Susan's classroom were four student desktop computers lined up against the side wall, and her teacher laptop was on her desk. She used her computer daily for activities such as attendance reporting and grade records, and on a regular basis test data analysis, uses that were expected of and mandated to all teachers in the school. Although she felt technology was "important," she did not think it was "the most important thing in my subject." Susan said she tried "with every major unit to use some type of technology, even if it is as a starter activity for the students or an ending activity where they have to produce some kind of product." She felt students should "be able to integrate technology into their lives" and saw her most effective use as "having the students use it as a tool to show a product that they have created from the knowledge that they have learned." Her dedication to teaching and student achievement was evident as she spoke about her beliefs on instruction and technology integration.

Provision of General Administrative Support for Teachers

There was no doubt in Susan's mind that the school leadership at Central Middle School supported technology use and integration. In fact, when considering the school as a whole, she felt "our administration is what I would call hypo-technology - we integrate technology into everything." However, her tone of voice indicated that this was not necessarily always a positive attribute. She elaborated with "it's a daily thing. It's expected of us. It is mandated to us, and they do offer you help but there's not tolerance for not using it." She saw support for acquisition of resources as being prevalent, with the leadership "constantly purchasing more computers, more data cards, more laptops,

more Smart Boards®… trying to get the technology that we know that students are going to need in the future." But in regard to her own use, she said,

> I try to use the technology as much as I can, but coming from a language arts standpoint, they do need to be able to write with their own hands and they do need to be able to make their own corrections without having a failsafe somewhere for them all the time.

In addition to resource acquisition, she also saw support for teacher professional development, at least as it related to new hardware or software purchased for the school. Those actions did not necessarily change things for all teachers though, as she acknowledged, "We do everything we can to get the technology, and they do everything they can to…get you trained to use the technology. But it is - you're technology or you're not."

Even though Susan believed there was overall and sometimes almost intolerant support for technology use by the school leadership, she also thought that support could be more effective if the leadership would "evaluate the expertise of the teachers" before making some decisions related to technology use. She elaborated further, saying

> Some teachers are very technologically oriented. Some teachers have already had the technology courses that they need, but even with that it depends on who taught the classes and how they were taught as to how much you really gained. I took my technology training in another county and although it was a wonderful class it, didn't go in depth on the things that I actually needed and now I'm having to relearn things as they come along. Also I don't think they should just assume that because you have some kind of degree that you are perfect on a computer.

Susan believed that not only should the leadership support the technology integration and use in the school, but also that the support needed to be tailored to diverse individuals in different ways and learning experiences adapted accordingly to help all teachers be successful without being intimidated because "you might be excellent in your

subject area but that doesn't mean that you could do a web page or whatever else. So they need to look at that first."

Provision of Professional Development Opportunities

Professional development on technology use and integration was "definitely" provided and participation was required. This training was often a yearly review and update on different administrative programs the teachers were required to use, such as the grade reporting software program. In the past year the teachers had been trained on how to use the new laptop computers they all had received and on the wireless Internet access that was now in the school. The teachers had also all been required to complete the state and system technology proficiency requirement either through courses offered at the school or through system professional development courses. Susan did not always find these mass trainings helpful personally though. She clarified this by stating,

> I think the biggest thing is that when new methods come in, instead of doing the shot gun method - let's everybody learn this in the 50 minute planning time or whatever. It might need to be more individualized, like at a grade level meeting. We're doing *this* specifically. We need to be in the lab but we need more than one day of it, not just going across and saying, 'this is how it's done, here's your sheet, figure it out later.'

As far as Susan was concerned, the atmosphere at the school was not always conducive to asking questions about technology use because

> Sometimes you feel uncomfortable asking someone because you're embarrassed that maybe you should already know this, but you still have to ask because you have to use it, and there's this aura of 'if you don't know technology that you're behind the times' or something's wrong with you. And you can still be a fabulous teacher, you know, even if you don't have the Smart Board® in front of your room.

A great deal of the professional development provided at the school had been on administrative uses of technology. In addition, some professional development had been

given “on ways that we can integrate things with our students” and sometimes it was “usable” but then sometimes it was “not applicable” the all the teachers because they don’t have a Smart Board® or because “you don’t have those facilities available to you.” She did think that the leadership tried since they did provide “some places we can go to pull up websites that will help us with certain things to use with our students.” The teachers had also been required this year to attend “a meeting or seminar whatever you want to call it about how to go past just the lower levels of user technology to make them get into the higher levels of critical thinking skills.” So although the professional development was available at Central Middle, it may not have been ideal for all teachers.

Provision of Access to Appropriate Resources

Compared to some of the other schools, Susan believed Central Middle School had better overall access to hardware. The majority of the academic teachers had laptop computers. There were eight interactive white boards in the school, three computer labs available on a sign-up basis, a laptop lab, and four additional smaller labs available for business/technology education classes, special education classes, and math remediation. Much of this hardware had been purchased with various grant funds outside the regular system-provided school budget. There were also a specialized writing remediation program and a math remediation program available at the school purchased through special budgets that were not available at the other middle schools. The school also had piloted wireless internet access for the system. Even with this seemingly large amount of access, Susan believed that much was “not applicable” to her because “you don’t have those facilities available to you.” Since Susan taught gifted education across all grade levels, she was not considered as part of a team (a group of teachers working in the same

grade level but with different subject areas who taught the same group of students throughout the day). This "off-team" position of the higher level students limited her access to technology in the school. She explained this situation as

> If you are on a team you have tremendous access to the labs….Due to my unique situation, I'm not necessarily in the schedule. We do have some computers in our classrooms, but on a team they have tremendous use. They are scheduled every so often that they have to be in there.

Susan thought technology was not the "most important thing in her subject area basically because of the lack of facilities." She further justified this lack of access by stating," I understand that in science and social studies where it could be very helpful, but at some point in language arts, reading and writing do need to take place without a computer." However, she made it a point to try to integrate technology into her teaching at least once during a unit and "within the limits that I have of the use of the technology." She also viewed the leadership as "trying to get the tools" which was "just money" for which the school was always writing grants and looking for free pilot programs.

Establishment of a School Vision and/or Culture for Integration

At Central Middle School the use of technology was "very important" with the school leadership being "hypo-technology" with the mandates and requirements of use. The leadership wanted technology to be pervasive in the school, and the school was "constantly purchasing more computers, more data cards, more laptops, more Smart Boards®." This indicated to Susan a definite school culture for technology use even though there wasn't a specific stated school vision statement about integration. According to Susan, this culture was not necessarily teacher-friendly to all as she had found that

> Coming from another system that wasn't as technology faceted as this one is, I was completely swept into a wave of things that I was unsure of, and you either

> got on the boat or you fell out of it and hoped that somebody put out a life preserver for you.

Her personal vision of technology use had also changed since she had come to Central Middle School, but not necessarily for the better. As Susan stated, "I saw technology as a tool. Now in some ways I see it as the albatross being hung around my neck, that everything has to be technology oriented, but we don't necessarily always have the tools to do it." Overall, she felt the school consisted of the dos and the do-nots as "either you're technology, or you're not."

In relation to the affect of technology integration on student achievement, Susan didn't know that it was "absolutely, positively necessary" that technology be "integrated into every single lesson that we do in order for them to have high achievement." She did think that in "some areas technology would be helpful" because there was available "a wealth of information through the computers." But as far as student achievement as related to test scores, Susan noted that the tests are not scored on a computer, so if the student's "entire instruction is through a computer or some type of technology, and then they are asked to do a pencil and paper test, sometimes it's hard for them to transfer from one to the other." Susan did think technology motivated the students, "sometimes so much to the fact that they will go beyond learning what the lesson is to how to play on the specific areas that they can." She has found that with some projects the graphics and "all kinds of things" are there but not the content because "they kind of lost the focus of what that was."

Pressure and Incentives for Technology Integration

Susan definitely recognized there was pressure to use technology in her school, especially in the administrative uses such as data analysis. She did try to integrate

technology into her classroom, and she made it a point to always offer a technology project "as one of their options." As far as being required to write and submit lessons, the teachers were designated to write a "certain amount of technology lessons" and turn them in to the ITS, especially when they were using the computer labs, and she had always turned in her plans. However, she only assumed "that they are checked for that, but I don't know for a fact." As far as being observed went, she said, "They've been in my classroom, but I don't think it was necessarily to check my technology use." In regard to being evaluated on technology integration she stated, "I don't know that we've gotten to the point where we are actually evaluating the teachers, but they are trying to encourage us to do this step by step."

Participant Summary

Susan Jones believed that although her knowledge of technology was not at the level she wanted it to be, she did possess enough technology proficiency to meet the basic requirements expected of her at Central Middle. She was confident in her instructional abilities and practices and did not think that technology use was imperative for high-quality teaching. She also desired to have more specific training for and understanding of how to integrate technology as it was specific to her subject areas and students, and she would be a willing participant if it was offered. It was interesting that in the entire duration of the interview, she never once mentioned asking for or receiving help or assistance for integration practices from the school ITS.

Susan believed there was strong support for and a culture of technology integration at her school, perhaps to the point of being forced to integrate whether or not she wanted to do an activity with that technique, and on occasion she was overwhelmed

by some of the expectations. Conversely, the support seemed to be more for selected individuals and student groups rather than equal access for all. Although she did not state it directly, it was obvious by her tone and some of her comments that she felt like she and her gifted language arts students were left out of the loop when it came to access to the computer labs and Smart Board®. The attitude and values of technology by the school leaders had not really changed her beliefs about what and how students should learn in her classroom and she was not convinced that technology use made a significant difference in student achievement.

Some teachers within the school had access to more technology hardware than did others, such as Susan, though she made a point to recognize that the school leadership was trying to acquire more and more technology for the school through grants and other budget strategies. Professional development had been provided though Susan believed it needed to be more specific to the individual teachers' needs at the current time and delivered in a more effective manner. Although there was the expressed expectation of writing lessons that integrated technology, there did not appear to be a consistent recognizable follow-up to this expectation through a teacher evaluation process.

Paul Davis

It was the first day of final exams for the middle school students and the school year was coming to an end in two more days. Paul Davis was busy with the paperwork and other obligations that hit hard at this time. Nonetheless, he agreed to meet with for the interview in his science classroom during his planning period. At first glance the classroom appeared to be just like any other middle school science classroom, with lab

tables around the perimeter of the room and posters outlining lab safety rules on the walls. As the researcher entered, Paul readily pointed out the interactive white board mounted on the front wall, the cart of Danas® (a hand-held laptop computer alternative), and also the scientific probes on the science lab counter. He offered a demonstration of any of his technology. His offer was politely rejected due to time restraints, but the researcher requested to come back at another time when students were present. It was obvious Paul was excited about the technology to which he had access in his classroom.

Paul was relatively young in age and in experience with only four years in teaching. He had been selected to be the science department chair this year and would continue this responsibility the next school year, plus he was also part of the Building Leadership Team. He described himself as having "always been very interested in technology - comfortable using it and anxious to get my hands on it." He had completed his technology proficiency through a course in his university teacher education program. He saw his most effective use of technology in the classroom as having the "ability to bring in external sources," especially in the form of websites, so he could avoid the use of the science textbook and also not have to "make photocopies of documents." He also used a great deal of video streaming to "introduce a topic or to summarize it at the end." Students used the Dana® keyboards and science probes "to do measurements, and then we can use the technology to graph them and then to scale the graphs and calculate mean and mediums and do mathematical calculations." He also regularly had a student sit at his computer and type up notes to be projected on the interactive board while he "ran the class" so the notes "go up on the screen and the kids can follow along that way." Overall, he liked to see "the kids get their hands on the equipment." He considered his style of use

a way of also training his students so that "they can train their 8th grade teachers next year." He wasn't especially talkative. Paul was definitely comfortable and confident with his use of technology and was willing to try and learn new technologies on his own initiative.

Provision of General Administrative Support for Teachers

Paul believed there was strong leadership support for technology use and integration, as the "principal is very, very big on technology. I mean, he wants to get it in here as quick as he can, and he's always looking for money to bring it in." He emphasized the leadership "believed highly in the use of technology" and they were "trying to get the teachers to increase their use of it" so that use of technology would "trickle down to the students who will gain proficiency as well." Paul also stated,

> Well, without the leadership, I wouldn't have the technology that I have in here today. I was one of the first teachers in the building –they asked me to try to step out and let them know how it works, what worked, and so I gave them very positive feedback about the tools they gave me to use. They are expanding the use throughout the school and they came to me – I didn't go seeking it but the opportunity.

Although he believed that the leadership was "very active in bringing it down to the teachers" he also thought "the weakest part would be teacher interest…there are some that are a little bit intimidated by some of the technology – although we do have some that are interested in it and like it." If he knew of other teachers that were interested, he then "passed that information on to our principal and the technology committee" and then the leadership tried to get those teachers "the equipment that they wanted." He felt that there were still a good amount of teachers who were uncomfortable with technology use, possibly even afraid, although "nobody's really said fear, well, I know that's kind of what

it boils down to" though it could also be "more like I don't want to have to learn how to use something new."

The greatest need for support in Paul's opinion was training. He felt it was "frustrating" to get new technology and he didn't "know half of what it's capable of doing just because you never receive formal training on how to use it." Although he was willing to experiment and decipher the technology on his own, he continued with

> Frankly, I don't think a lot of other teachers would go to that trouble to figure it out. To me it's a challenge. But for other teachers it would be extra work. So if they're going to implement new technology such as software and hardware they need to have training provided… a lot of times the most benefit of the software program are not the most obvious and a lot of times they're hidden.

Overall, in Paul's opinion, leadership support for technology use and integration was available at Central Middle. He stated that "right now I think they are doing what they can, but the only limitation right now for them is lack of money."

Provision of Professional Development Opportunities

Professional development had been offered at Central Middle and attendance to the training held at the school was required of all teachers. Interestingly, no mention of the state or system required technology proficiency course were mentioned at all during Paul's interview. The professional development that was prominent in Paul's mind was the data analysis software training. There had been a great deal of time set aside for training on this software because there was a "big push from the administration to start using it on the unit ends and not just on the benchmarks" as was currently required of all teachers because "the more data that we can analyze the more reliable it is." The school leadership had even requested Paul "to be a train the trainer type situation so anyone in the science department or on the seventh grade hallway, or anybody on my hallway in 7th

grade could "come to me if they had questions." He said he would do that for them because "he didn't want to refuse."

Modeling, or at a minimum, teachers seeing peer teachers use technology in their classrooms, was another strategy that Paul saw as a method of possible professional development, at least as possible motivation to learn to use technology. He thought that "once the teachers start getting a taste of it and they see it used in other classes they say oh, wow, that looks really great - I could really use that in my class" and then they would pursue and show more interest learning about technology.

Technology training that was not provided but that Paul would like to see offered in his school included "basic software things like Excel® - I think there's a ton of stuff that you can do with Excel but I don't know how to do those. I'd like to get training on that." He also desired more staff training on the new hardware and software the school had recently purchased, such as how to implement the interactive handheld voters used with the interactive boards because "it took me a while to figure out that you can actually make a quiz out that is self-grading" which was a feature he now liked to use. He felt that when such technology was "available to more than current staff, then we need to get training on those programs." He thought the school leadership "may be holding off on that right now since there's only about five or six teachers that actually have it, and perhaps when it is more widely distributed in the school there will be more staff training." But in the big picture, Paul believed "we need to have training, and it's hard to do all staff training regularly, and especially with all the updates with technology. But we do a lot here."

Provision of Access to Appropriate Resources

According to Paul, access to resources at Central Middle School was "excellent" because

> I've been provided with a lot of the technology. Any time I've had a problem and needed support it's very quick. So I would say that support is very strong at this school and the condition is excellent because I'm getting some of the new stuff to try out for the school.

Paul realized that his situation was not the norm for all the teachers in the school, and he understood "it's going to take a couple of years to roll that technology out." All teachers did not have access to the all of the different hardware and software as Paul did. However, he did "believe that if our principal had the money he would have this equipment in everybody's room right now." At the current time there was "at least every team has one teacher with high tech stuff in their room – then they get the feedback from the students." Because of the expense of the technology and the budget restraints to purchase it, the leadership team was writing different grants to try to "obtain outside funding to help us."

Currently in the school there were computers and computer labs available to all teachers. Smart Boards® and interactive writing tablets that worked basically like miniature Smart Boards® but were about "half the price of a Smart Board®" system were also in some classrooms, along with the Dana® keyboards, science probes, and remote interactive voters. In general Paul thought the leadership was "taking strong actions in getting it in there, just not as fast as they would like."

Establishment of a School Vision and/or Culture for Integration

Paul saw the vision or the "master plan" for the school as trying to "increase the use of technology with all teachers." One way the school was attempting to make that

master plan happen was "targeting teachers that are more technologically proficient to introduce it to the school." As far as his personal vision of technology, Paul thought technology was extremely important because there were the "tools that the kids are going to need to use in order to have a career in the future." He further commented that

> In the past it may have been a hammer and a saw. Now it's computers and different kinds of technology, and they need to be proficient on them if they are going to have job skills in the future. For gainful employment in the future they are going to need to be very proficient in technology.

Paul thought technology use may have some affect on the student achievement, but it was "hard to measure the achievement." He continued with

> I think I've seen that you can measure that with non-traditional types of assessments where they are actually using the equipment – I've seen achievement in that regard, whereas I think they are understanding the scientific method better because they're actually using it to measure things, and they know what to do with that data – so I think it's helped a lot with that area.

Paul still didn't think that technology had helped "as much in the content knowledge because that requires studying which they still don't like to do." He felt technology had "helped more with keeping them focused on what we're doing in class but not so much with retention. I think retention is what they need to work on their own, and I haven't had that impact yet." The effect on motivation was much more clear to Paul as he believed that "technology really, really helps with keeping the students engaged, and you know who's not on task immediately, and you can get them back into the game, so to speak." The example he gave centered on the use of the hand-held remote interactive voters that could be used to answer assessment questions via special software. Paul would show a short video clip segment to the students, post several questions on the interactive board about the content they just watched, and then the students would have to vote on the answers with their remotes. Using this activity he would know "exactly who's not

engaged because their number doesn't pop up as having responded. They look forward to it. They're like, 'oh do we get to play the game today' when you're really giving them a quiz. But they don't look at it that same way."

Pressure and Incentives for Technology Integration

There was definitely school leadership pressure to increase the use of technology throughout Central Middle, and it was clear that money was being pursued to purchase additional hardware. Paul thought incentives for using technology came through "implementing it in different departments like we're doing and scattering it throughout the school so that at least every team has one teacher with high tech stuff in their room." This action would then provide other less-proficient teachers the opportunity to see other teachers using technology and "that kind of encourages the teacher, well maybe I should start implementing those technologies in my room."

In his experience there was intent by the leadership to observe technology use in the classroom because "pretty frequently people come in my room to see what we're doing in here. Our principal brings people down there pretty regularly to show off the technology that we have that we're using and show them how it gets the kids engaged." However, Paul did not know if technology integration was "part of the formal evaluation process yet." He thought that "at that point it [technology integration] may become more of an evaluation item, whether they're using it or not" stating,

> What we're doing is rolling it in, whereas this year we just required all teachers to have the webpage with their resume and their syllabus and contact information. Now it's just a bare bones requirement. I think next year they're going to make a requirement for teachers to take it up a step and start using it as part of their daily resources.

Participant Summary

Paul Smith had a high comfort and confidence level in his ability to use technology both personally and in his classroom instruction. He believed technology integration into the classroom was very valuable, and he also felt he possessed above average skills in his ability to work at "figuring out" how different hardware and software operated and could be used in his class. He was self-motivated and saw himself as innovative and willing to try new things, even if it took a lot of his personal time to do so. He also understood that there were things he didn't have enough knowledge about and desire to participate in additional professional development to gain the comprehension and skills that he lacked.

Paul believed that his school leadership felt strongly about technology acquisition and use for his school, and he enjoyed being a part of the group of teachers selected to have the high level of access that he did. He had a very positive attitude about technology and valued its use. Since he had always been interested in and comfortable with using technology, he didn't think the school leadership support had "really changed my views, it just made me able to implement my views." He tried to use all the different technologies available in the school building in his teaching, substituting many traditional types of classroom activities such as paper and pencil quizzes, notes, and handouts with more current, higher technology versions such as interactive voters and websites.

The lack of interest and/or proficiency in technology use by many other teachers on the faculty was apparent to Paul, and he believed that more modeling and more training could be a great help in trying to get them to increase their use of technology. He also thought that as the school was able to acquire more of the technology and get it in all

the teachers' room, the behaviors of technology integration would then increase at the school. He saw the school leadership as big supporters of this move continue to get more and more hardware and software for the school.

Bob Graves

"In the hands of a master teacher" and "being a forced multiplier" were terms Bob Graves used several times at different points in the interview in his office at Central Middle. A laptop and a desktop computer were open on the corner of his desk, and a number of framed recognitions for educational achievements for both him and the school adorned the walls. The interview took place one morning about three weeks after school had been released for the summer break. Bob had just returned from a week's vacation and his neatly organized desk was covered in stacks of papers and folders, and he remarked that his email account had over a hundred messages ready for him to sort through. Even though he had a load of work to catch up on after his brief time off, he was willing to take an hour of his morning and put off all phone calls and other interruptions to meet with the researcher for the interview.

Bob had just completed his first full year as principal of Central Middle School after serving as an Assistant Principal there for the two years prior. He had been in education for a total of fourteen years, three of which had been in this system, and he had entered the education profession after retiring from a career in the United Stated Army. He had completed his state technology proficiency course in a different system. During his time in the military, Bob had been involved in the implementation of new computer systems at the national training center used by the Army, and at one point he had owned

his own computer networking company. These experiences had led to Bob being a "big believer in technology" and a self-professed "old geek" who did not have "a lot of tolerance for people telling me it's hard to build a webpage, or that it's too difficult to put your lesson plans online, or they don't know how to do this or they don't know how to do that, or their mailbox is full." He supported technology in the school "one hundred percent" and spoke very proudly about the different hardware and software the school had acquired and implemented through purchase or participation in a pilot program. This attitude was supported through his comments throughout the interview process.

Provision of General Administrative Support for Teachers

Bob classified himself as "a Techie – a big believer in technology" and in using technology in the classroom. In order for technology to be integrated effectively into the classroom, he thought the process had to begin with the leadership team in the building, and that there had "to be a definite positive attitude about technology. I think there has to be an understanding about the limitations and strengths of technology." He continued with "I think you have to have an administration that believes that technology can be used, and they have to have the ability to check up on the teachers to make sure they are using it and it is not being abused." In addition, he thought that the ITS and Intel "need to be extremely good, and they need to be dedicated and on top of it as you roll things out."

Bob believed a major part of his role was "locking the resources" and pursuing more technology and the funding for it. He had procured "a lot of pilots" and was "actively searching - we're really chasing money more than any thing else right now."

He saw himself as very lucky to have an "extremely good" ITS that he met with daily and worked with in a method he regarded as collaborative since

> He and I spend a lot of time discussing what the teachers are doing, comparing notes on what we see in the class, working with data, to see where we can get the biggest bang for our buck and as far as what's effective in the classroom - I think that the principal has to really be a person that goes after resources, but if the principal doesn't have a strong IT then that's the first thing you have to do is find yourself an IT that is a big believer in technology, and a master teacher.

Professional development for the teachers to use the technology provided was another area of support Bob provided because he felt the teachers "don't really need to know much about the support and technical side of the house." He thought the "number one thing that has to be considered is to make sure that you have master teachers" because "if you have a master teacher, you can multiply him and make him four times more effective, then you've got that quality of instruction to more kids." He also sought to "identify those teachers that are to be most apt to utilize what technology we have" and then set those teachers up as the "train the trainer models within grades" so that in turn the leadership could "expect them to become the experts for rest of the teachers on the team."

Bob thought one of the best examples of uses of technology in his school was "high learning support math labs" where low-performing students took a second math class in order to try to bring them up to grade level performance. He also saw technology as being "extremely good in presentation and more traditional ways where you can have the students interact if you have voting eggs [wireless remotes] or some sort of voting system." His teachers were expected to increase communication with parents by placing "their homework as well as odd projects up on the internet" with a "goal of one hundred percent participation" although only about half of his families had access to the Internet.

From the administrative side, he saw the best use of technology in the school as the required use of the data evaluation software. With this software he was

> able to require teachers to bring their laptops to meetings, and I have my laptop with me to actually disaggregate data, so when I sit down to talk data with them everybody pulls up their data, I pull up the groups data, and we're all able to talk and you can actually walk them through, and it's like it's a meeting with each teacher individually, but I'm not.

He regarded this activity as one way he was demonstrating by example his belief of technology use. Overall, Bob felt he was a very strong supporter of technology use and integration in his school and saw himself as being part of an administration that believed technology could be used and had the knowledge to monitor the teachers to make sure it was being used correctly.

Provision of Professional Development Opportunities

Bob believed that providing professional development to his faculty was important but emphasized that he thought "you have to be careful about just having general training." He thought that the local technology proficiency courses were "much better than the technology training I went through" because when he took the course he was "bored to death and actually wound up teaching part of the class - and it was a joke and a waste of time." He thought "if you want technology training to be effective, it's just like any other staff development - it needs to be targeted to a need." When Bob decided to provide a new software program or a new type of hardware to teachers, he believed he needed to show them how to use it, to have follow-up training and then "you need to check and be sure its being done. That's much more effective than taking them out and showing them a whole bunch of things and saying you can do this but you don't have to."

Professional development for technology use started with new teacher orientation where the ITS "spends half a day just bringing each new teacher in the building and getting them geared up - passwords, and understanding how to access." When the teachers came in for pre-planning week, more training was provided on reviewing what they already had or any new technology that was going to be implemented that year. Any professional development and training that was provided at the school required all teachers to attend, and Bob added that, "I not only participate but I lead some. Lead by example is always going to be best. You do a lot of modeling."

In addition to modeling, the train-the-trainer model was deemed very important to professional development at this school at both the grade level and at the school level. This model had been implemented in both the data analysis software program and with the writing analysis program the school had implemented, and Bob planned to have the two teachers who had piloted a math remediation program to be part of a train the trainer model in the next school year. In reference to teachers acting as models for other teachers, he believed that "you do it by grade level a couple of times, and you've turned everyone's attention - what you check is going to happen." On the whole, Bob believed that the professional development program was more than adequate to meet the needs of the teachers at Central Middle.

Provision of Access to Appropriate Resources

Although Central Middle possessed more technology hardware pieces and software programs than the other two middle schools in the system currently had, Bob still professed that "we consider ourselves to be fairly technology poor. We're still trying to acquire a lot of technology." During the summer break, he planned to add the

equipment needed to create five more 21st Century Classrooms in addition to the eight already in place. He saw that additional access as "just now starting to have enough hardware as far as technology for instruction."

Bob and his administration had Blackberry® handheld computers provided by the school system. Central Middle had been the system pilot school for a wireless Internet access system, a status Bob explained with

> We actually sought that, being competitive, knowing full well that we were going to have a lot of down time, and there were going to be a lot of hassles and extra powers involved and what have you. It gives us a chance to get the technology we can't afford. We didn't have a couple hundred thousand more sitting around."

The majority of the teachers had been provided with laptop computers so that Bob was "able to require teachers to bring their laptops to meetings."

During the past year the school had also acquired five more classroom sets of Danas®, and two additional math-focused computer labs had been added to the three labs already in place. A computer lab for the collaborative special education students was being created for use in the fall. In addition to the regular computer allotments provided from the system budget each year, Bob also had the school "recycle our dead computers so we actually expand at a higher rate. It's not that expensive to support and to put a little more memory in them and sometimes a hard drive can go."

Central Middle participated in as many pilot programs as they could for software also and was the pilot site for both the data analysis software and the writing analysis software that was later purchased by the school system for wider use. Bob had recently closed another deal to finance "a math program that's started by a start-up company here in [city] and a [local university] professor that we piloted this year, and it's been very effective."

"A lot of support at the county level" was available to the schools and the system was regarded as "friendly" toward technology use. The network system was "seldom down for very long" which Bob thought was important for the teachers. The fact that the local school board and system paid "for both an IT[S] and a network technician at every school" was also very important because that was "something that's not required, not paid for from the state." Bob had high regard for the ITS at Central Middle and considered him not only strong in technology use but also a master teacher. He felt this was a very important aspect of the support provided at his school because

> The ITS needs to be a master teacher and if you don't - I think you can compare different ITSs in our system - if you take the ones that have been teachers of the year and the ones that appear considerably as master teachers in their field, they understand what it is the role of technology may play.

The only complaint about access to resources, other than the desire to acquire more and more funding to purchase technology he wanted in the school, was the wish that there was a "better email filter" because with spam "you get 300 e-mails a day, and that becomes difficult to go through."

Establishment of a School Vision and/or Culture for Integration

It was clear that Bob considered himself a "techie" and a "big believer" in and supporter of technology with a long personal and professional history of use. He explained the school vision as wanting "to use as much technology as we think is a multiplier for teachers in the classroom." He explained, "I personally do not believe that technology or a computer can replace a master teacher, but in the hands of the master teacher, it can be extremely effective and can help you assist more students achieve." In addition, "you can multiply him and make him four times more effective - then you've got that quality of instruction to more kids." He continued with

> The same pedagogy works. It's the same educational psychology as far as children. The children still need that human interface; nothing will ever replace the human or human brain or the human interaction, the ability to read cues and work with that child, coach that child. It has to be seen as a tool.

He felt that in the hand of a bad teacher, technology "just makes a bad class worse, and the technology is abused – it can become a babysitter." He believed this was true now as it was when the

> cutting-edge technology was a film strip projector or a phonograph machine. It's the same weakness. The teachers have to be dealt with the same way so if you just think of it as a tool, another instructional piece of equipment, then I don't think it's dealt with any differently.

He felt that he was lucky to have enough background so "if I have to correct them personally, which they don't want to have happen by the principal, I can do that and that makes I think a big difference." Bob was sure that background set a culture and "tone of expectation" among both the teachers and the leadership team that technology use is "just an expectation." Personally he didn't feel the school or system had influenced his beliefs other than that he considered the system to be "very technology friendly place" and he was becoming more aggressive in finding "grants and resources."

The school was actively collecting data to try to determine the influence technology was having on student achievement. He felt that to this point the biggest impact had been "on our low-level students" because "with our remediation efforts, I think we see that as achieving, and if we have it (new technologies implemented) for the entire year, I think we'll see more."

In regards to motivation, Bob saw technology as "part of our culture, it's part of our society, and so children definitely use it." The concept of the master teacher using

technology was again reiterated with,

> If it is in the hands of a master teacher that has actually developed a detailed lesson plan and used educational psychology, then it's a great motivator… I think one of the big benefits you get there is not so much the motivation as it is again, a forced multiplier - being able to reach more kids at a deeper level.

Pressure and Incentives for Technology Integration

Bob felt that he had set a "tone of expectation" for technology integration at Central Middle School. Part of the pressure to integrate technology was a requirement that all teachers submit paperless copies of their lesson plans by subject and grade on a common network drive so these plans would be archived for a year or more. A minimum of one plan per week was supposed to be turned in and those plans were to be evaluated by a system of grading and the LoTI scale rating. The teachers were also aware that he and the other school leadership were observing technology integrating lessons although there hadn't been a quota set for a particular amount on any grade level. Bob saw these observations of current technology use by teachers as setting up "a competitive environment" so that when teachers were doing lessons with technology "they're generally going to let me know. If the kids are doing something they're going to let me know so I can come see. They want to brag. We have a lot of that going on." Observations were both formal and informal, depending on the class. For the classes that had the 21st Century Classroom equipment, "those teachers are going to have all the evaluations for the technology because it's a resource they have." Although his overall plan was to use informal observations to "identify the teachers that are technology users," for the teachers that did not have this hardware in their classrooms, they were observed for technology integration they were doing "if you happen to be in there when they're

doing it." Even when he interviewed potential new teachers, Bob said that he screened for technology use, beliefs, and proficiency as part of his hiring process.

Participant Summary

Bob Graves was very confident in his knowledge of technology hardware and software and had a long personal history of using technology in and out of the public education settings. He held a strong belief in the importance of technology use and integration in the school and classroom, and he was confident with his ability to implement and support its use in his school. He saw his expertise as above average in relation to many others in his school, and he had little tolerance for those who were not as motivated and willing to implement new technologies as he thought they should be.

Bob believed that he provided excellent support for technology integration, especially in the areas of resource attainment of hardware and software programs to implement. He felt his beliefs and support of technology set a culture of expectation of use in the school and also that the different requirements and programs he had implemented would have a positive influence on the technology integration attitudes and values of his teaching faculty. In fact, there would be little tolerance for not adopting the new behaviors and performances as both the equipment and expectations of its use increased in the school. In addition to acquisition of material resources, part of his support was to provide the professional development the teachers needed for technology use to create the changes needed in attitude towards and value of technology integration.

Even though he did not personally observe all teachers for their technology use skills and competencies, Bob felt the school ITS and other master teachers who he had set up as model users and train-the-trainer practitioners influenced the desire and skills of

other teachers to integrate technology in the classroom. He felt that this practice along with his modeling of technology use in his professional role would continue to emphasize the importance of integration into all areas of Central Middle School.

Within-Case Analysis

The guiding question of this study was "Is there a difference between the school leadership and the teachers in their beliefs concerning support factors that affect technology integration?" One multi-grade language arts teacher, one seventh grade science teacher, and the principal were interviewed at the second extreme case, Central Middle School. Differences and similarities in the beliefs and perspectives of support between these participants are discussed here.

Provision of general administrative support for teachers

All three interview participants believed there was general administrative support for technology integration provided at Central Middle School but that support was viewed differently. Paul, a science teacher, and Bob, the principal, both felt the support was consistent and strong, while Susan saw that same support as consistent but also noted there was "not tolerance for not using it." All three participants agreed the leadership's strongest area of support was the provision of financial resources for purchasing new hardware and software for the school. Both Paul and Bob mentioned that the school leader was and should be a high user of technology but Susan made no mention of the leader's personal use.

Beliefs about the most effective use of technology in the classroom were also seen differently by all three participants. Susan saw the most effective use as project creation; Paul saw the most effective use as the ability to bring in external resources, including

websites; and Bob saw the most effective use as remediation support for low-performing students.

There were other differences in the beliefs about the general leadership support provided at Central Middle. Bob believed that technology was best used with a master teacher with whom it could then become a "forced multiplier." He believed the professional development offered at his school was very good and required his teachers to attend all sessions. Susan, however, had very different beliefs, starting with a master teacher did not necessarily need technology to be effective, nor did low technology use make one a poor teacher. She saw the faculty as divided into two groups where technology was concerned, basically the haves or dos and the haves or do nots. She also believed there needed to be much more individual consideration when it came to teacher technology use and integration, and that more differentiated support for professional development and integration also needed to be available. Although he considered himself a high and proficient user, Paul believed integration practices were low or weak with many of the teachers, partly because they either felt intimidated or fearful of the technology or they were just resistant to change. He also believed the professional development or training provided was not always relevant to all teachers and more should be available that was on-time and applicable to a specific need.

Provision of professional development opportunities to increase knowledge about computers and integration

All three participants at Central Middle stated there was professional development offered at the school and that all teachers were required to attend all sessions presented. In Bob's view, the professional development offered was targeted to needs of the teachers

and school, and he recognized his need to “be careful” when offering mass professional learning. He felt he targeted the professional development to needs and that he had the skills necessary to perform the required “follow-up” with teachers to ensure the training had been effective. He felt the modeling of use that was currently taking place in the school was well done and effective with encouraging others to become better or more motivated users. In addition, he demonstrated his support of technology integration and use by both participating in and sometimes leading various learning activities.

The views of the teachers were not quite as positive as Bob’s views were. Susan did not think the professional development offered was always effective, helpful or comfortable and that there was not a need for all teachers to participate in mass professional development for all of the school’s different initiatives. She felt the training she had received was more for administrative uses of technology rather than instructional, and when she did participate, she wanted the session to be specific to her needs and timely to her need so it would be applicable to what was happening in her classroom at that time, not perhaps at some time in the future. Paul believed the professional development needed more detail and more review, with both aspects provided in a timely manner. He also felt that much of the training had been more for administrative than instructional purposes, and he agreed with Susan’s belief that sessions needed to be both timely and relevant to specific needs and subject areas of the participants. Paul also stated that additional and more effective modeling needed to take place in the school than was currently in place, with the focus being on the low or reluctant users to encourage them to move toward higher integration practices.

Provision of access to appropriate resources

Access to resources was another support area that all three participants believed was available, but each saw in a slightly different manner. Susan felt the overall access in the school was better than the other middle schools, but not equal for all teachers, and she had some hardware in her room (four desktop computers). Paul saw the access as excellent for all, himself especially, as he had a 21st Century Classroom with additional science hardware, but also admitted that he was part of a select group to have that high access. Bob thought the overall access was good, better than the other two middle schools, and that there was sufficient hardware in the classrooms, but he wanted to get more as fast as he could. When the topic of computer labs was addressed, once again there were three different perspectives. Bob believed the access to computer labs was excellent, while Paul was a little less enthusiastic but still thought computer lab access was good. However, Susan stated that computer lab for her students use was restricted because she was "off-team" and did only gifted pull-out classes, and she was not included in the computer lab rotation schedule. She also stated that not being on the lab rotation did not bother her too much because she felt that the students needed to focus more on the content knowledge in her language arts class than they did technology use. All three participants mentioned the writing of grants to try to obtain funding for new hardware and software, and Bob also pointed out the school's participation in as many pilot programs as possible to increase the access also. As far as personnel who provided support to the teachers was concerned, Bob believed the school ITS was a major and important aspect of the school support system, but neither Susan nor Paul made any mention of the ITS at any time during their interview.

Establishment of a school vision and/or culture for integration

There was no formal written statement of a school vision for technology integration at Central Middle and all three participants agreed on that fact. There was a culture of integration though, even without a vision statement. Susan believed it was clear that technology was "all important;" Paul believed it was clear to teachers that technology use was expected; and Bob believed he had set a definite "tone of expectation" for technology integration. The descriptions of that vision and culture varied for each of the three individuals, sometimes quite drastically. Susan believed the culture was somewhat oppressive, with technology use being mandated and required to excess to the point of some teachers feeling intimidated. Administrative use seemed to be a stronger focus than instructional and there was always a push and a need for more equipment, more software, more things. Paul simply believed the vision was to increase technology use through targeting the current high and strong users and giving them extra access as a model to other teachers (and he was one of those models). Bob stated that technology could make a master teacher better, "a forced multiplier," but would make a bad teacher worse. He also felt that would not happen in his school because he had the knowledge and ability to monitor and correct teachers as they used technology and ensure its appropriate use.

In regards to the effect technology had on student achievement, once again the beliefs differed among the participants. Susan believed technology might be able to help some with achievement but it was not necessary, and technology could have an influence on motivation but it was not necessarily an academic influence. She also mentioned technology use would be a part of the students' future career needs so it had to be

included at some point in the schools. Paul believed technology might help student achievement although that would be hard to measure and prove at this time; he did believe without doubt that technology increased motivation, especially with the area of student engagement in a lesson. Bob believed technology had a positive influence on student achievement, especially the low-level students, and although he did not currently have data to prove it, he was in the process of acquiring that data. He also believed technology increase the motivation of students, again with the focus being on the lower level students.

Provision of pressure and incentives for integration

All three participants stated there was a definite feeling of pressure to use and integrate technology at Central Middle, with Bob adding there was also a "tone of expectation" from the leadership. They all also agreed there was a requirement to write and submit lesson plans that included technology integration but their explanations differed somewhat. Susan stated there was a requirement to submit such lesson plan, especially if one was planning to take students to the computer lab. She thought the plans could possibly be monitored but she had never received any feedback on those she had submitted. Paul stated he included technology in most of his lesson plans and went on to explain how he posted his support sites and materials on his teacher website for all who wanted to use those. Bob affirmed the lesson plan requirement, stating that one plan per week was to be submitted and those plans were evaluated using the LoTI levels rubric.

According to Susan, there was no observation or evaluation requirement for technology integration in the classroom, or at least none that she was aware of or had been required to do. Paul stated he was observed fairly often due of the amount of

technology he had in his room and the leadership wanted to "show-off" that technology. He agreed with Susan there was no evaluation requirement at the current time but it was possible there would be in the future. Bob agreed there was no quota for technology integration observations; however, he did conduct observations informally if the teacher had the 21st Century classrooms or other additional technology available to them in their classrooms, and he would go to observe any other teacher integrating technology upon their request. He also stated he did formal evaluations of technology integration for those teachers with the extra technology access in their rooms because he wanted to see the equipment in use, but he only conducted informal evaluations of the other teachers' integration practices.

As far as incentives were concerned, Susan did not perceive any occurring at the current time. Paul believed that his having and using the technology with which he had been supplied provided a model and incentive to other teachers to use what they had more and then they too might be able to get what he had. Bob reinforced that belief with the statement he created a "competitive environment" in his school where the teachers wanted to show him what they could do with technology so possibly they would be rewarded with more access in their classrooms in the future.

Summary

This chapter has included the contextual setting of Central Middle School. The individual case finding of each interviewee were presented followed by a within-case analysis of this school's participants. The data revealed that the school leader and the teachers at Central Middle seemed to have some overall similar beliefs about technology integration in relation to the main categories identified. However, the specifics of these

beliefs within the categories identified differences, such as Bob's belief that the professional development offered at the school was strong and effective, while both teachers believed there was a need for better professional development that was more tailored to their specific needs, more instructional based, and more effective. The next chapter will present the contextual setting for the third extreme case, West High School, and the individual case and within-case findings from that set of interviews.

CHAPTER SEVEN

CASE FINDINGS - WEST HIGH SCHOOL

Purposeful sampling from a volunteer group was used to select teachers for participation in Phase Two of this study. The participants represented three different schools in the Eastland School System. The following provides the contextual setting of the third extreme case school, West High School.

Contextual Setting of the School

West High School opened in 1976. The second high school to open in the system, it was located across the street from the first upscale neighborhood to be developed in this county and near a busy state highway known as a main thoroughfare through the area. West High School had been named a Georgia School of Excellence and had received a long list of academic and athletic accommodations and awards since its opening. Since its opening, West High students had consistently scored above state and national norms. One recent award was the 2005 Silver Award for the Highest Percentage of Students Meeting and Exceeding Standards on Georgia testing. The school mission reflects this pride in achievement: Tradition, Excellence, and Patriot Pride: Developing Young Minds for a Strong Community.

West High served 1500 students in grades 9-12. The student population is 63% White, 30% Black, 5% Hispanic, 1% Multi-Racial and 1% Asian, all minorities being below the system average. It has the lowest free and reduced lunch percentage in the

county at 23 % and no students participating in the LEP program. About one-half of the faculty had earned a Master's Degree, a third had their Bachelor's Degree, eight teachers had their Specialist in Education Degree and two had earned their Doctorate Degree. Two-thirds of the teachers had less than 20 years experience. There were four administrators, two White and two Black, two with a Master's Degree and two with a Specialist in Education Degree, and all four had more than 20 years experience in education.

In West High there were approximately 400 computers, all networked with high-speed Internet access. All classrooms had a minimum of two computers, and a few had three or four. There was one general use computer lab and one laptop lab. Two interactive white boards were in the school with both of them being used as part of a 21st Century Classroom set up. Teachers had about five hours per week available for instructional planning that was not otherwise committed to meetings or parent conferences. The Instructional Technology Specialist had been in education for over 20 years and in this position for seven years.

The LoTI level report for West High showed the staff average at a mid-level need for future technology integration professional development in most skill areas. The overall LoTI level was at 3 which is described as technology-based tools augment selected teacher-centered instructional events and some higher-level cognitive processing may be taking place. In the 2005 SACS report, actions planned to address areas in need of improvement were to monitor the use of all computer labs to determine the effectiveness of use and to evaluate the design and content of computer labs to ensure they support student learning. The student survey completed for the SACS report

indicated that most students did not believe that their teachers used technology enough in the classroom; however, they did agree that technology was available throughout the school.

Hal Johnson

The researcher met with Hal Johnson for the interview one morning during his planning time. It was final exam week and West High School was very quiet and the halls were still. The interview took place in Hal's room where he taught regular, gifted, and Advanced Placement history and also Advanced Placement art classes. The walls were covered with maps and posters that reflected and enhanced the academic content studied here, and the ceiling tiles were all painted in a variety of different art styles and representations. In addition to the teacher computer at Hal's desk, there was one student computer against the wall. A multimedia projector used to project images from the computer and onto the pull-down screen was on a cart at the back of the room. This was by far one of the most visually stimulating and appealing high school classrooms the researcher had visited in this school.

A life-long resident of this county, this school year concluded Hal's twentieth year in education and his twentieth year in this school and system. Although Hal had volunteered to be an interview participant and was quite pleasant to speak with, he was not very talkative during the interview, and the researcher had to make a continuous effort to get any elaboration on responses to the questions posed. Hal was currently working on his Specialist in Education degree and part of this program included a course that met the state and system technology proficiency requirements. Hal saw himself as proficient in the skills he needed to use technology, and he thought it was "important to

make technology available" for teachers and students to use in classes. In his classroom Hal used "a lot of PowerPoint for presentations, more of supplement, not 'here's what I'm going to say to them.'" He thought the multimedia projector and educational compact disks had been "invaluable," especially for his AP Art History class, and he used these "almost every single day" along with virtual tours of "online museums" available through the Internet. With the Internet he was also able to have his students "visit websites to tour the Sistine Chapel and things like that online - it's most valuable." Overall, he felt that "technology was a useful tool for the teacher" and that the PowerPoint presentations with "all the pictures that I can make available" were currently his most effective use of technology in the classroom.

Provision of General Administrative Support for Teachers

Hal believed the school leaders at West High did support the integration of technology into the classrooms philosophically even though there were current "economic limits" that created shortcomings in making enough technology available to all classroom teachers. In general he felt that "it's mostly the physical we need." Training for using technology and computers had been made available to all teachers by the school leadership who was "dedicated to training," and the school Instructional Technology Specialist had conducted the majority of this training. Although this training was probably needed by many of the veteran teachers, Hal thought it seemed "like a lot of the younger teachers especially are coming ready and comfortable with technology." The school ITS was seen as a representative of the leadership support efforts and provided help to the teachers as needed. He also saw the leadership support of integration since "we're allowed to assign projects and assign work and to use the Internet practically

all we want - that's our non-conditional allowance. They do allow us to explore the technology in a new way." So although Hal did feel like leadership support was present for technology integration, he still thought there was room for improvement for both support and use, stating, "Again it's probably a little innovative and different for the administration and the teachers who have been around forever, and probably to support that innovation is more difficult."

Provision of Professional Development Opportunities

Hal clearly believed the provision of at least the "opportunity for training" to all teachers at West High was the area of strongest and most noticeable support provided by the leadership. The system provided program for technology proficiency was required and pushed by the leadership. Hal had participated in the program, but he had not completed the final module since he was "getting credit through a course I'm taking in my Specialist degree." He thought the professional development he had received was "very good" and he could "remember how to do it for a little while, but unless you are using it all the time it goes away, and when I start a new project I have to go to the ITS and refresh how to do that anyways." He saw technology training "like a language - it's going to go away if you don't use it." In regards to any future technology-centered professional development, he wanted for the school leadership to "let me decide what I want - I know that we don't need more programs…" and continued with, "I want it to be available but not to be required." In summary, as far as the provision of technology professional development was concerned, Hal felt "If I start to utilize the technology, then I will go and find out (how to use it) and it will stick with me because I will continue to use it. If I'm not using the technology, I don't need any training."

Provision of Access to Appropriate Resources

When considering the access to technology resources at West High, Hal believed there were some "shortcomings" due to a "shortage of some machines that we need at the school." There was just one computer lab available in the school to which he could only occasionally take his students to use for projects. Implementation of Smart Boards® had just begun at this school and he knew "the teacher next door who has one loves having a Smart Board®." He understood this shortage to be the results of "economic limits" but his tone of voice seemed to indicate some irritation with his school's lack of the interactive boards and similar resources because he knew "some of the new schools are getting tons of Smart Boards®, but I think we still only have three or four - no, two or three or something like that, in the whole school." He accepted that "there are some roadblocks economically, etc. and that does get in the way" of getting all the hardware the teachers needed, but he also believed "the implementation depends on the availability of technology in the classrooms."

Hal did think the school ITS was "great, and any time we need something or help operating something, it's there." The ITS also taught the different professional development classes at the school and provided help with "setting up websites and using the equipment." In summary, even though Hal believed there was some provision of access to appropriate resources, there was still a pretty strong need for more access, especially in the areas of hardware throughout the school.

Establishment of a School Vision and/or Culture for Integration

Hal believed there was a vision and culture at West High for classroom technology integration, but he could not give any type of clear vision statement to support

that belief. He saw the leadership vision as to "equip us with more" technology and to "eventually want to have the technology available to the teachers." He believed the leadership was "dedicated" to providing professional development to the teachers but that the actual implementation in the classrooms depended upon the "availability of technology in the classrooms." As to his personal vision, Hal believed

> Technology isn't a way of teaching and if you can't teach without technology you're not going to be able to teach with technology. It can enliven lesson plans. It can engage students. It's a useful tool for the teacher. It should not be a crutch.

Technology use affected student achievement in Hal's instruction by "supplying the visual element to my lectures. I think it stimulates and helps them retain the information." Technology could also affect student motivation to some degree because the students liked to use computers "from time to time and go to the computer lab. They also enjoy the reinforcement that the visuals add." However, as far as using technology for increasing student motivation as a whole, he believed that "its not that certain kids are motivated by one teacher technique - they certainly like teachers that are student-centered, and I think technology helps to reach a grouping like those."

Pressure and Incentives for Technology Integration

At no point in the interview did Hal express any belief of any clear pressure or incentives for technology use by the school leadership other than the pressure to complete the system technology proficiency requirement courses. The school leadership had not make a point to observe him teaching any technology integrating lessons although he was not sure if any of the other teachers had been observed or not. When asked if the school leadership evaluated teachers on their technology use, he replied, "They probably do some form, but I really don't know." Further prodding with examples of possible

methods of pressure and evaluation were given by the researcher but Hal's only response was simply, "Nothing like that as far as I'm aware of." In defense of his school leadership Hal did elaborate with the thought that technology integration was "probably a little innovative and different for the administration," and therefore to support that type of innovation was more difficult for the leadership than traditional evaluations.

Participant Summary

Hal Johnson regarded himself as an experienced, strong, student-centered teacher who used technology as it fit appropriately into his instructional practices and as the availability of resources allowed for its use. He was confident in his knowledge about and ability to use technology as he wanted or needed to, and also in his ability to seek out resources and assistance as he found a need for additional knowledge. He felt comfortable with his personal use in his classroom. He believed that technology was a valuable tool that could have a positive influence on student achievement and motivation, but it was not absolutely necessary for him or any other teacher to utilize in order to be effective and engage the students.

Hal believed his school leadership was being as supportive of technology integration and use as they were currently able to with financial restrictions that were placed on the school. He did not see the leadership as having a big influence on his integration behavior or his value of technology integration into his instructional practices, and any influence that did exist came through support and information provided to him by the school ITS. He believed that any additional changes in his use of technology would not come along until he was provided with more hardware to use in his classroom,

and when he received that hardware, he would decide for himself what, if any, additional training he would want and need.

Terry Moore

The interview with Terry took place one afternoon in her classroom during her planning period. It was the last week of school and the building was unusually quiet since many of the students had checked out early following completion of their final exams. Terry's classroom looked very much like a traditional high school classroom. There was a whiteboard covering most of the front wall with random math problems and end-of-the-year notes scrawled on it. Several mathematics and inspirational posters hung on the walls. The student desks were organized in rows and in the back corner of the room was the teacher's desk and work computer. Two student computers were placed along the opposing wall. Although sparsely decorated, there was still warmth to the room's character that made it feel like a comfortable place for learning.

Terry was a veteran teacher with twenty years of classroom experience as a math instructor. Over her career she had taught all the different mathematical course offerings available in high school, but the majority of her teaching load this year had been regular and advanced Algebra and Geometry courses. She had been teaching in this system for fourteen years, five of which had been at West High School. Terry had completed the required technology proficiency a couple of years before through system courses offered at the school by the ITS. She professed to "enjoy the technology" to which she had access. Technology offered one way for her to "teach a student to be self-learner or self-explorer" and improve problem solving skills. The most effective technology-based tools that she currently used were the graphing calculators that were used as part of calculator

lab assignments. She also used a geometry software program on a regular basis as a "demonstration tool" for problem solving concepts. Terry felt it was important to give students optional computer-based assignments in all of her classes for those students who had home access, but she tended to give more computer-based assignments to students in her advanced classes because they were more likely to have computers in the home. Although she wanted to have her students do more activities with computer software, her limited access hindered her ability to be as innovative as she would like to have been. Terry was not extremely loquacious, but she was open and straightforward throughout the interview process.

Provision of General Administrative Support for Teachers

"Encourage" was a verb Terry used repeatedly when referring to the school leadership during her interview. She believed the school leadership supported the teachers in technology use and integration because "they encourage us to take training," "they comment about it at weekly faculty meetings," "they encourage other faculty members to send out e-mails to let us know what is going on" with technology in their classrooms, "they encourage participating in the Outstanding Technology-Integrating Teacher program," plus there was a school ITS who "encourages us to use the technology." Overall, she saw the school leaderships' affect on technology use in the classroom as "more of a vision…more of an overall where we would like our school to be, but not how it affects your daily use." The main influence the school leadership had had on her daily use was related to required administrative programs such as "the records - grades, attendance, those have become more and more important."

In Terry's opinion, time was the biggest need for leadership support – time to plan, time to meet with other teachers, time to get together to brainstorm with colleagues about effective ways to use technology in the classroom lessons. After that, the need for better access to computer labs at the school was a need she felt was not being adequately met. She elaborated,

> If I can sit with other teachers that are effective and they've had a good lesson plan, and then we had the time to sit down together and brainstorm and take that plan back and use it. That's what holds you back more than anything - the time to plan. Then if you don't have a good lab set up, you've wasted time.

So although there was generally an atmosphere of general administrative support for teachers and technology use and integration in the West High, Terry believed there were also some areas for strengthening and improvement of that support.

Provision of Professional Development Opportunities

Professional development courses for the teachers in technology use and integration had been provided at West High on a regular basis over the past several years. According to Terry,

> Professional training in the school has been pretty steady. [The system technology proficiency course] has been provided here over and over and over; that was required, that we had to do it, and the school made sure even above and beyond the call of duty that we did get that.

In addition, the school leadership provided additional professional development to the teachers outside of the school as they "do pay for in certain instances for us to be trained." However, not all professional development attempts were successful. Before the implementation of the system technology proficiency courses during the after-school hours "there was a series that we were asked to do during a certain planning period, and I don't think there was the kind of response that our administration wants to see."

There was also more informal types of professional development provided at West High School in which Terry participated, conducted mainly by the school ITS but sometimes by another teacher. Terry elaborated with

> Our ITS offers to help and has trainings, and we went during our planning periods, and then he is very accessible if you want to come to him or him come to you to teach you any other new thing you want to do. He tells us what he does after that, if you have an interest about what you would like to do, he says I'll help you do it. He doesn't always make us go somewhere to find out how to do it. He'll find out and then he'll tell us.

Terry also felt lucky to have a mathematics department chairperson who was also "very technology savvy" who would provide small group training for his department. He would say to the other math teachers "I've learned how to do this... if you'd like I'll show you or we get together for a department meeting." Although this professional development strategy would take place at a required department meeting, the actual training "was optional if you wanted to stick around and hear about the technology." In summary, Terry believed that her needs for professional development had been supported and that she really didn't need any more training at this time because she thought "many of us are trained on the software we use." She concluded her statements about professional development with, "I really don't feel like there is something I want or need that's not being provided. If I ask, the tech people respond."

Provision of Access to Appropriate Resources

In Terry's opinion, access to appropriate resources, especially in relation to hardware access in both the school as a whole and in the individual classrooms, was not a strong area for West High. The majority of the classrooms only had one or two computers for student use available, which Terry did not see as very effective for instructional use. Access was also limited to computer labs. There was only one open lab for classes to use

that was "not as convenient for the time needing to be spent and things that I'd like to include," and she was restricted to using it only three times during the past year. There was also on laptop cart available for checkout, but that only contained one computer for every two or more students. Although there were plans for third lab for the next school year, "for 1600 students it's not enough." Simply put, Terry stated, "Accessible? I'd put a bad mark on that one."

There were two rooms in the school set up as 21st Century Classrooms and Terry saw the teachers who had those setups as "becoming more and more savvy. They have the opportunity. They have it in their room to plan with to work with." She continued with "It cuts down on the excuse for the getting it to you when it's in your room, so I think the best thing they can do is to get us more material in here. More technology in the building would be the best thing they could do for us." As to what the leadership needed to do for the teachers, she thought it would be useful for them to locate "any way we can gain funding to increase the computers, laptops in the building, the Smart Boards®" so the teachers could have the hardware at their "fingertips."

Terry believed the school ITS was "fabulous" and that he provided "very good support" to the teachers in the school. He was especially supportive in that he "finds answers for us." Terry clarified with

> He is very accessible if you want to come to him, or him come to you, to teach you any other new thing you want to do. He doesn't always make us go somewhere to find out how to do it. He'll find out and then he'll tell us. Whether it's required or optional, he'll offer things like 'I've learned how to do this or that.'

So although Terry believed there was a lack of access in hardware and similar materials at West High, she did believe the personnel support was available when needed and was beneficial to her and the other teachers.

Establishment of a School Vision and/or Culture for Integration

There was not a specific written vision for technology integration Terry was aware of at West High. She stated, "I don't know that a technology statement has been made as a vision statement, but you have the feeling that the students will prosper with as much technology as is possible." She saw technology use and integration "as more of an overall vision and not something that is specific" with the overall school vision being "that we use technology and use it efficiently." She believed the existence of encouragement by the leadership for teachers to "take training" and participate in the Outstanding Technology Teacher of the Year program, and the provision of "very good support that encourages us to use the technology" indicated the vision was in process of being "filled." However, when asked how the school leadership's vision had directly affected her daily use of technology in her instruction, she could not think of "anything that affects specifically my students, motivation or achievement - not really." She did believe that students needed to learn to use technology while in her classes because

> Particularly in high school, if we don't train them to use technology, they're not ready for the world today. And I've noticed, even in my lowest level classes, it may possibly be even more important for them. Out of those classes and those kids are going to have to go on to jobs and be expected to use technology as well and they're not exposed to it.

Terry believed technology did have an influence on student achievement "because the world of knowledge for mathematics is expanding that way" and technology also encourage some students to be "self-explorers" and better problem solvers. As for the

influence technology had on student motivation, Terry felt it "varies from student to student. I think that when maybe even ten years ago it was very much a motivator. There is so much technology out there now it's not as new. It's more of an expectation and less of a motivator than it was in the past."

Pressure and Incentives for Technology Integration

Although the teachers had plenty of "encouragement" to integrate technology at West High School, Terry did not believe there was any real pressure or incentives from the school leadership other than to complete the system required technology proficiency requirement. There was not a requirement to write or submit lessons that utilized technology integration or standards although she did try to use technology on a regular basis in her lessons, including using the graphing calculators nearly every day, and at other times, different available software "depending on the unit" that was being covered. The school leadership did not require teachers to be observed doing technology integrating lessons; however, "if you make one up, they want to come down and see what's going on." Any evaluation on technology use by the school leadership was done "only informally." The main incentive Terry saw in place at her school was the encouragement to participate in the system Outstanding Technology Teacher of the Year program where the rewards provided to the teacher for being the school winner included a laptop computer and digital camera for classroom use.

Participant Summary

Terry Moore believed she had acquired the knowledge of computer and software use and instructional strategies necessary for her to effectively integrate technology into her classroom lessons. She was comfortable with her ability to use the technology

available to her, and she used that technology as often as she could with the access restrictions that were in place. Terry did not feel she needed any additional training until there were new materials available to her. The leadership at her school had done a good job of making professional development available and accessible to all teachers employed there.

The school leadership provided overall support and an encouraging culture for technology use and integration at this school. However, this support did not have a big effect on her day to day behaviors related to use of technology in instruction; the influence was stronger in required administrative uses of technology such as record keeping. Her actual practice of technology integration was limited due to access to physical resources and time to plan for technology use, especially time to work and brainstorm with other teachers about ways to use the technology that was available to her.

Although there was a feeling of encouragement and desire to have technology integrated throughout the school so that the students would "prosper," Terry knew of no definite requirement of instructional use from the leadership. There was very good personal use support provided by the school ITS; however, in Terry's viewpoint, more classroom and school-wide access to physical resources such as computers and Smart Boards® was a definite need. When there were more teachers and classrooms with technology such as computers, projectors and Smart Boards®, and more time available to plan for technology integration, Terry believed there would be more consistent and effective use of technology throughout the school since that availability would allow teachers to become more "savvy" in use and drastically reduce the excuse not to integrate because of lack of access.

Frank Grant

The interview with the principal of West High School, Frank Grant, took place one early afternoon two weeks after school had been released for summer break. Other than the bookkeeper, he was the only other person and only administrator in the school office that week, and it was obvious he was trying to juggle many different activities at one time. After a brief wait while he completed a phone conversation, Frank and the researcher met in his private office for the interview. His office was softly lit with incandescent lamps and decorated with a variety of different photos from school groups and activities, and also his family members. Several awards and recognitions for the both the school and him individually also adorned the walls. His desktop computer sat on his desk with his email displayed on the monitor, his Blackberry® handheld rested in the charging cradle, and his personal cell phone was on top of a stack of papers. It was a welcoming and comfortable office of a principal who cared about and had great respect for family, faculty, students and education.

Frank had been in the education profession for sixteen years, with nine of those years in this system and at West High. He had been the principal of West High for seven years following two years as an assistant principal. He has seen this school and community through trials, successes and changes, and he had helped lead it to many state and local recognitions, including awards for academic, music and sports programs. Throughout the system West High was known for its high academic standards and traditional approach to education of students. The faculty here was relatively stable with many veteran teachers, and many had been on this staff longer than had Frank. The most recent award received by this school was for being in the top 4% of schools in the state

that met and exceeded the state standards on the state curriculum testing. Frank had completed the system and state technology proficiency requirement by participating in the system-offered courses. He considered himself to be comfortable and proficient with the technology he used on a regular basis, and he tried to model the importance of learning about technology by attending any training held at his school. In his opinion, currently the most effective uses of technology in his school was the implementation of the interactive white boards where the students could see a presentation or web site on the board and interact with the image on the board, and also the hand-held electronic voters which allowed students to answer questions independently and see their answers recorded anonymously on the screen. Two teachers at his school had the 21st Century Classroom setups and Frank had observed such activities in those rooms. Although it was clear that Frank was a very busy man, he was very willing to be interviewed, even amid interruptions, and he was candid and to-the-point throughout the interview time period.

Provision of General Administrative Support for Teachers

When asked about the role he felt he played as a school leader for technology integration, Frank responded, "Well, I think that we would like to say that the school leader has a big impact." He believed that he was providing the general administrative support necessary for teachers increase their technology use and integration. Even though the teacher practice of technology integration had "gone from zero to about 40 percent," there was a still a need to get the classes to a place "where the students, who are usually so much further along than our staff members, are in getting more use of technology than the teacher." Frank thought technology integration was "very important in today's schools. I think the kids are ready for it. I think the teachers are a little bit less a go for

it. I think that it's very important that we match stride for stride with the kid's need for technology in the classroom."

The provision of professional development for technology use and integration on the school campus had been an important focus for Frank over the past four years. Through "harping" and "hounding" his teachers complete the system technology proficiency course, he believed he had "created that expectation that you (teachers) be literate in technology." He also encouraged use by asking the teachers to tell him "how they're using it in their classroom" although he also felt "confident that all of our teachers could do it if we held their hand and pushed them a bit further." In addition to structured professional development, he also thought the modeling of technology integration by peers was important because "we have to show them the resources that are out there; using the web lessons, getting them to see other teachers in the building – how they're using it." Some of this had been done at the school with some success, especially with video streaming, but this modeling process remained a strong need throughout the more resistant faculty as Frank admitted, "Right now we are still having to go, look, here, this is what it can do, and go from there."

In addition to providing the professional development, modeling, and encouragement for technology integration and use, he also saw his support role as an investigator of new technology and it's appropriateness for his school, to make sure that the decision to purchase was the best move for the money and not be necessarily be the "early adopters - let's make sure that it's truly time-tested and it's what we need. Being on the forefront with our new technology is not that important." Frank believed it was his role to "find out how it can improve student learning, how can it help us do our job better,

how can it benefit the whole school, and is it something that we can afford to support down the road" because what use was it to purchase equipment that he couldn't afford to maintain or to purchase a software license for which "the first year was cheap" but then he couldn't afford the renewal for it. As new technology software and hardware was brought into the school, he did additional research to determine research "to find teachers who are using tech more" and to "give new equipment to teachers who use more as reward." Overall, Frank believed he was taking the necessary actions that he could at the time to support technology integration at West High. However, he did feel there might be more that he could do in the future, stating, "I do think I play a role, but unless I'm totally focused on that (technology), that kind of goes to the wayside of me monitoring it."

Provision of Professional Development Opportunities

The high schools as a group in this system had been much slower than the elementary and middle schools in getting their teachers to complete the state and system technology proficiency requirement. A major project for Frank over the past two years had been to have his teachers take the courses needed to complete this requirement. At this time there was only one teacher on staff who still needed to complete this requirement, and Frank attributed that completion success to the fact "I hounded the fool out of them."

In addition to requiring the teachers to complete those specific courses, Frank also attended and completed the proficiency courses to model their importance. He explained, "I sit through any staff development that we host and that I mandate - I either present myself or I sit through it. It's very important that they see the seal of approval by me." He also attended any additional technology-centered training or presentations held at

West High, whether it was one of his teachers presenting for group of peers a "demonstration of what is available" or modeling of technology use by another teacher because if "I sit through the whole class so then they realize that - well, it's important enough for him to take his time – they'll take their time." He summarized this push in professional development by stating

> For the last two years, that's what we have harped on, but now that we can all check the box off that we have done it. Now let's look at how we use it. So now that's coming up this year. What are we going to do to use the skills that we now have just learned or just proven that we learned?

There was no additional specific professional development that he could immediately think of he felt was needed at his school. However, he also believed there would need to be more professional development necessary in the future to really see growth and changes in technology integration in classroom instruction. Frank expressed that belief with

> I do think that we just need to not let the teachers get by on finishing the (system proficiency course). I think that we need to take our LoTI surveys and continue to follow up on that, and whatever training that those show us that need to be done, then let's follow up and do those.

Overall, Frank believed much had been done to provide knowledge to the teachers through the local courses, but there would also be a different and continuing need for more in the years to come.

Provision of Access to Appropriate Resources

Frank believed the technology resources available at West High were "excellent" and the "computers are so much newer than most schools in other school systems, and we are really on the forefront of pushing for new equipment." He also thought the support

given to the schools by providing the instructional technology specialists was important and "that helps us quite a bit." He appraised the situation with

> I think that for the teachers - as far as support like helpdesk type items - are excellent. I think the equipment that they get to work with is excellent. I think our computer labs are current, I think we are so much further along than some systems are as far as, if you want to use it, we've got it, and it's current.

Although Frank did think there was adequate access to technology resources at West High, he also saw some areas of need. Video streaming was available through a state provided program, but sometimes the network was too slow for it to work efficiently. Even though there were at least one or two student computers in each classroom, few of the teachers used them as effectively with the students as learning centers. Most of the televisions in the school had presenter boxes connected that allowed the computer screen to be projected on them, but these were not as effective as the full screen projectors, and there were only a few of those in the school. There was also a need for more interactive white boards in the school since those were only in two classrooms. Frank saw the general current access to appropriate technology resources as excellent, but also believed it would be improved upon with an expansion of the 21st Century Classrooms models so there could be "a lot more of the two-way learning that goes on using a big screen and the InFocus® machines and the individual survey clickers/ buttons."

Establishment of a School Vision and/or Culture for Integration

When asked about the school's vision of technology integration, Frank made statements that were about the hardware and software available at the school and what some of the teachers were doing with that technology, but never really about what the vision or preferred future outcome was for the school. Frank did personally believe

technology use was important in schools today and that there was a need for more teacher use in the classroom. He believed the school leadership team had "created that expectation that you be literate in technology" and had pushed "teachers to use tech in classrooms." He saw an existing need for teachers to "match students' needs of technology in classroom" and be able to "give up some of the control to students."

As far as the effect of technology on student achievement, Frank stated, "I don't necessarily believe that it's necessarily affecting it... I don't think that we have done a very good job of student achievement data gathering. So that I really don't know that it's helping." Frank also did not see technology as being the motivating force that it had once been "ten years ago when it used to be the motivation for the great group when they get to go to the computer center and play games." He thought the current students "are motivated if it's an independent learner, where perhaps they're motivated to go off and do what they want to do with a computer, to create something, to research something ... but I think that's about 15 percent of the kids...that's not a lot." When commenting on the overall use of technology in education, Frank concluded, "I think it can help a teacher; it can help the student. But I don't think it replaces one or the other."

Pressure and Incentives for Technology Integration

Although Frank had evidence there was technology integration occurring in the classrooms in West High, there was no specific practice at this time to require lessons to be written and submitted that utilized technology integration and standards nor was there a specific practice by the school leadership to observe technology integrating lessons as part of any evaluation. He had asked teachers to "tell me how they are using it" and did informal evaluations of use as he made classroom visits. As new equipment became

available at the school, he researched to determine "who is doing the best with the technology that we had at the time, and I rewarded those teachers by giving them those pieces of equipment." The system Outstanding Technology-Integrating Teacher of the Year program was supported and also made into a monthly school recognition program in order to provide further incentives for integration to the teachers.

Stipulating that all teachers would complete the technology proficiency course had been a one major area of leadership pressure over the past couple of years. Frank felt he had "pushed teachers to use more tech in classrooms;" however, he did think he could probably push even more because "if I monitored use of technology more, that would help me. That way it would be integrated more."

Participant Summary

Frank Grant was comfortable in his ability to use technology and to support its use by his teachers in West High. He believed he had the knowledge needed to recognize effective and successful technology integration practices occurring in the classrooms and identify those teachers who were making the best use of what they had before rewarding them with new or more technology. He also believed it was important to match the students' needs for technology use and for the classroom use to become more student-centered in the near future.

Frank saw himself as supporting technology integration in his school, especially in the areas of providing professional development to the teachers and pressuring them to complete the available training. He supported those teachers who wanted to try new technologies in their instruction and had them share their knowledge with other members of the faculty who were interested. He felt his faculty understood there was an

expectation that they would be proficient in technology use, and he saw a need to guide them new levels of integration in the future. Although Frank had a positive attitude toward technology use and integration, he also believed it was not a substitution for a good teacher nor could it necessarily solve any achievement issues for students.

In Frank's viewpoint, the school system had provided the schools with excellent access to computers and other technology equipment and also good personnel support through the ITS position. He would continue to support the acquisition of more technology as long as he felt it was in the best interest of the school and the best use of the school's funding, and continue to encourage integration throughout the school by providing professional development for the teachers and informally monitoring the integration practices of his teachers.

Within Case Analysis

The guiding question of this study was "Is there a difference between the school leadership and the teachers in their beliefs concerning support factors that affect technology integration?" One multi-grade social studies teacher and one multi-grade mathematics teacher and the principal were interviewed at the third extreme case, West High School. Differences and similarities in the beliefs and perspectives of support between these participants are discussed here.

Provision of general administrative support for teachers

All three participants believed there was general administrative support for teachers present at West High School, and all three also believed the strongest aspect of that support was in the provision and requirement of professional development. All three

also believed the leadership encouraged teachers to use and integrate technology in their classes and allowed them some freedom in exploring and sharing integration techniques. Both teachers perceived the school ITS as an extension of the school leadership's support. The beliefs about the most effective uses of technology were, however, different for each. Hal believed technology's most effective use was the ability to provide, create, and display a great variety of graphics for the students. Terry believed the graphing calculators were the most effective, and Frank, the principal, believed the interactive white boards with the hand-held voters represented the most effective use.

Other ideas of general support did not show a consensus between the three. Hal felt the support was not as strong as it could be due to economic shortcomings that caused a shortage of technology, and also that the leadership's support of technology may be complicated by a lack of background knowledge. Terry felt there was a great need for more access to resources and for more time to learn about, practice use of, and plan lessons for technology integration. Even though Frank believed he was providing the support needed to the teachers in his school, he also believed there also needed to be more student-centered use rather than teacher-centered use as the students were overall more proficient with technology than the teachers.

Provision of professional development opportunities to increase knowledge about computers and integration

Professional development was the strongest area of leadership in all three participants' perspective, and there were both optional and required options available. Frank stated he had "pushed" his teachers to complete the system technology proficiency courses, which he saw as good courses, and he also attended all the professional

development himself to model his support of the programs. He also believed more professional development would be needed in the future in order to move technology integration to a higher level of implementation. In Hal's perspective, the proficiency courses had been basically good but he had not retained the information and needed review on a regular basis. He believed professional development should be available but not required, and it should also be timely and directed to specific needs and interests of the teacher. Terry stated the school leadership had made funds available for some of the teachers to go out of the school setting for specialized professional learning, but the majority of the training she participated in now was optional and informal, usually provided by the school ITS, teaching peers or the department chair person. Terry also believed she had no need for any more formal professional development related to technology at the current time.

Provision of access to appropriate resources

Beliefs about the access to appropriate resources were somewhat different between the different participants at West High, with Frank's beliefs more positive than the teachers. Frank believed the school in general had excellent resources, and the hardware and software access provided was better than most other local school systems. He felt the computer lab access at his school was good and the computer labs contained up-to-date machines. He believed his school ITS provide good personal support to the teachers. The shortcomings in access included a need for more interactive white boards and the slowness of the system network.

Hal believed the access at West High was generally less than other schools in the system and the computer lab access was limited at best. He felt there was a shortage of

hardware which created a great need to acquire more, although budget restraints may be an issue with that situation. He did believe the school ITS was supportive and helpful for the teachers. Terry also believed the access at the school deserved “a bad mark” because the technology in the classroom was inadequate with only one or two computers and computer lab access was very limited as well. She agreed with Hal in that there was a shortage of hardware and need to acquire more. As the other two participants stated, Terry believed the ITS was both supportive and helpful.

Establishment of a school vision and/or culture for integration

As with the other two school cases, there was no written or agreed upon vision statement for technology integration at West High. Although there was no direct statement, Hal did think there was a leadership vision to provide more hardware. He also felt the outcome of any vision of technology integration in the classroom would be influenced greatly by the hardware available to the teacher. Terry said there was a “feeling it’s important” supported by the leadership’s push for professional development, and that indicated their vision, plus there was also a feeling the students would benefit from more technology use. Neither teacher believed the school leadership had a direct influence on their personal vision of technology integration. Frank believed the teachers knew he envisioned technology as important because he had created an expectation of technology literacy through his professional development and classroom use encouragement. He also recognized the teacher’s need for more technology but didn’t see that as his most important focus at the current time.

In reference to the effect technology had on student achievement and motivation, once again the beliefs differed among the participants. Hal believed technology facilitated

student achievement through the visual stimulation it could provide. Terry believed achievement was influenced by technology's ability to provide opportunities for problem solving. Frank did not believe technology necessarily had an effect on student achievement, but he also stated he had no data to prove whether it did or did not at this time. He continued with his belief that technology could help students but it could not replace a good teacher in a good classroom setting. Both Hal and Terry believed technology only had an effect on the motivation of certain individuals or subgroups of students, and Frank believed technology was no longer really a factor in student motivation as it may have been in the past.

Provision of pressure and incentives for integration

Hal and Terry both believed there was no real pressure for technology integration at their school other than the completion of the professional development courses for the technology proficiency requirement. Other than that particular situation, they both believed teachers were encouraged but not pressured. All three agreed there was no technology integration lesson plan submission quota, no mandatory observation of that type lesson, nor an evaluation of integration skills required by the leadership. Terry and Frank saw the system Outstanding Technology Integrating Teacher of the Year programs as the main incentive offered to teachers, and that program was supported by a monthly school winner. Frank also felt he provided some incentive to teachers by identifying the high-user teachers and rewarding them with more technology as funds became available. As he reflected during the interview, Frank added the thoughts that he could possibly do more to drive more integration practices at his school but it simply wasn't his focus at all times.

Summary

This chapter has included the contextual setting of West High School. The individual case finding of each interviewee were presented followed by a within-case analysis of this school's participants. The data revealed that the school leader and the teachers at West High seemed to have some overall similar beliefs about technology integration in relation to the main categories identified. However, the specifics of these beliefs within the categories identified differences, such as Frank's belief that the technology access at his school was very good and both of the teachers' beliefs that the school access was lacking in both classroom and computer lab access.

Chapters Five, Six and Seven have included the context and data for each individual case. For each participant's perspective to have meaning, it was also important to present the context of the school system and the particular schools in which the teachers and school leaders worked. Each case presented data regarding the participant's beliefs about the availability of support factors that enable technology integration and actions the teachers and leaders took that demonstrated their beliefs about technology integration into instruction. Each chapter concluded with a within-case analysis of the teachers and leader of each school. Data specifically addressed five categories of factors related to support for technology integration: (a) provision of general administrative support for teachers, (b) provision of professional development opportunities to increase knowledge about computers and integration, (c) provision of access to appropriate resources, (d) establishment of a school vision and/or culture for integration, and (e) provision of pressure and incentives for integration. The following chapter will use all of

the data collected to present the cross-case analysis and discuss common themes in relation to the research questions.

CHAPTER 8

CROSS CASE FINDINGS

The purpose of this mixed methods case study was to investigate the beliefs of school leaders and the teachers concerning support factors that affect technology integration. It took place in a mid-sized suburban public school system located in the southeastern region of the United States of America. Phase One of the study consisted of a quantitative survey that was used to gather data on beliefs about technology integration and then used to identify extreme case schools. To further define this study, one leader (the school principal) and two teachers from each identified extreme case were interviewed to explore each participant's beliefs and perspectives concerning support factors that affect technology integration.

The qualitative interviews were conducted to address these questions:

1. What are school leaders' beliefs about the support role they play in teacher integration of instructional technology?
2. What are teachers' beliefs about the support role that school leadership plays in teacher integration of instructional technology?
3. How do school leaders describe the support they provide for teacher integration of technology in the classroom?
4. How do teachers describe the support they receive from school leaders for their integration of technology in the classroom?

This chapter provides a cross case analysis of the school leader participants and then the teacher participants beliefs and perspectives concerning support factors that affect technology integration. Belief statements and perspectives about the role that school leadership plays in teacher integration of instructional technology and the supports provided for teacher integration of technology were compared for commonalities until a saturation point in the data was reached.

The nine participants worked in three different schools of the Eastland School System. Of the 19 schools in the system, the schools represented in this study mirrored the range of demographics of the school system. West High School had the lowest free and reduced lunch population. Central Middle and North Elementary were both above the system average for free and reduced lunch, and North Elementary was the highest of the three. The majority of students at North Elementary were Hispanic, at Central Middle were Black, and at West High were White. All three schools had met Adequate Yearly Progress as defined by No Child Left Behind indicators for the system for the school year of this study.

Each of the schools had modern computers in every classroom that were wired and networked with high-speed Internet access. There was at least one computer lab for general use and one laptop lab available, and at least two interactive white boards in classrooms in each school. Each school also had at least one 21st Century Classroom set up with a laptop or desktop computer, an interactive white board, a projector, and a VCR/DVD player. There was an Instructional Technology Specialist on staff at each of the schools. The teachers at each school all had four or more hours of instructional planning time available per week during school hours.

The LoTI level report for all three schools showed the staff was at a "moderate level of need" for technology integration professional development in most skill areas. For North Elementary, the overall LoTI level was 2, a condition where technology-based tools generally supplement or support the existing instructional program. There was a "high level of need" for teachers to use technology for complex thinking projects. For Central Middle and West High the overall LoTI level was at 3. This is a condition in which technology-based tools augment selected teacher-centered instructional events and some computer activities may incorporate higher-level cognitive processing. The goal LoTI level of the system is 4 or higher where technology use is student-centered and addresses higher level thinking skills. This report on the instructional technology use level helped confirmed the teachers' beliefs that the majority of their technology professional development had recently been focused more on administrative uses and hardware use than on pure instructional uses. The SACS report for each school contained suggestions for improving the school instructional technology program. These reports also indicated the need for more instructional uses of technology in the classroom by a larger number of teachers, additional beliefs held by teachers. The computer lab usage reports were obtained for each school, and although these confirmed the school-wide use of the computer labs, the data collected by the reports were not specific enough to provide verification of specific instructional uses. These vague reports supported teachers' beliefs that there was little or no observation or evaluation of technology use being conducted by school leadership.

Cross Case Analysis – School Leadership

The school leaders were interviewed to discover their beliefs about the role they play in teacher integration of instructional technology and also how they described the support they provided for teacher integration of technology in the classroom. The school leaders were Holly from the elementary school, Bob from the middle school, and Frank from the high school.

Provision of General Administrative Support for Teachers

All three school leaders indicated they believed they played a role in teacher integration of instructional technology that included the provision of general administrative support to the teachers and also that their teachers knew of their support of technology in their respective schools. Bob summed these beliefs with, "I think you have to have an administration that believes that technology can be used…." Each of them believed their support of teacher professional development, which included teacher completion of the state and system technology proficiency requirement, was an indicator of that support. Each leader also had some sort of a system in place to match new technology equipment received by the school to those teachers they considered to be high-users of technology. In reference to support actions, Bob and Holly believed their strongest aspect of support was to obtain financial resources and "actively fund technology," and Frank believed his strongest aspect was his encouragement and push for professional development.

While each leader believed they demonstrated support, there were differences in their technology skills and overall beliefs about technology. Although all three had completed the technology proficiency requirement, Holly considered herself to be less

proficient than most of the other principals; Bob, a self-professed "old geek," perceived himself to be high on the use ability scale, and Frank made no mention of his personal ability. Each also had different perspectives on the most effective integration of technology based on what they saw as important for their school's success. Each of the integration practices they mentioned supported the use of current school practices. Holly saw student research and teacher presentations as most effective, perhaps because this was what she was most familiar with seeing the few higher-using teachers in her school do with their students. Bob saw remediation software applications as the most effective, possibly because this was a way to help his school achieve adequate yearly progress and to bring the low performing students to acceptable performance. Frank saw the interactive whiteboards and voters as most effective, perhaps because it kept instruction teacher-centered while also allowing for some student interactivity and interest due to the novelty of the equipment. Holly was the only leader to make mention of the teachers' need for planning time to be available for technology integration practices. She also believed she had provided that time for her teachers within their existing team planning time.

Provision of Professional Development Opportunities

The three leaders in this study believed there was good quality professional development for technology integration provided to their teachers. Both Holly and Frank classified the professional development at their schools as being either required or optional, while Bob classified all professional development at his school as required. All three also believed it was important to attend the professional development session at their schools as an example of their support. As Holly noted, "If I'm not there it doesn't

send a good message. Well, actually, it sends a message - it's just one I don't want sent. It's 'if I'm not there then it's not that important to me.' And it is important." Frank explained, "I sit through any staff development that we host and that I mandate - I either present myself or I sit through it. It's very important that they see the seal of approval by me." Bob took it one step further and said, "I not only participate, but I lead some. Lead by example is always going to be best. You do a lot of modeling."

A teacher acting as a model of technology integration for other teachers was a professional development strategy all three leaders felt was being used effectively at their schools. Frank expressed, "We have to show them the resources that are out there: using the web lessons, getting them to see other teachers in the building – how they're using it." Holly saw modeling as a benefit for those teachers in her school who did not already use much technology because then they could "see other teachers are modeling that [technology use] and they see how much the children enjoy it, and how much the teacher enjoys using it because she thinks it's so effective, and because of that, they want to do it as well."

As far as needs for current or future professional development for their school, each leader had different perspectives. Holly felt there was a need for more training that was on-time and relevant to specific needs. Bob thought his school's professional development was already targeted to needs and basically required his follow-up as a monitoring device. Frank thought there would be a need to provide professional development for teachers to implement a higher cognitive level of technology use with students in the classroom. Although all three leaders indicated professional development

was offered on their school site, only Holly identified her school ITS as a main purveyor of those offerings.

Provision of Access to Appropriate Resources

The three leaders all believed the access to appropriate resources at their schools was from very good to excellent; however, all three also expressed a need for keeping the technology current and acquiring more as funding became available. Holly felt the "access was already there" and that her main role as a school leader was to seek funding "to enhance the technology that we have." Frank supported that belief with "I think the equipment that they get to work with is excellent. I think our computer labs are current; I think we are so much further along than some systems are as far as, if you want to use it, we've got it, and it's current." Bob believed overall access was good at his school and better than the other middle schools; however, he was not as positive as the other two principals. Although his school had eight 21st Century Classrooms and was about to add five more, he still felt that they were "just now starting to have enough hardware as far as technology for instruction." In reality, with the eight 21st Century Classrooms, his school already had four to five more than did the other two middle schools.

The leaders were also in agreement about three other areas of support related to access to appropriate resources. All three believed there was sufficient access to computers in the classrooms, well equipped and current computer labs available to all teachers, valuable support provided by the school level ITS, and quality system support for technology. Holly emphasized her beliefs by saying her school was "very blessed to have and instructional technology specialist, Intel and all the technological support that we have from central office." Bob echoed that belief by pointing out that the local school

board and system paid "for both an IT[S] and a network technician at every school" which was important because that was "something that's not required, not paid for from the state." Frank also stated that in his school the "computers are so much newer than most schools in other school systems, and we are really on the forefront of pushing for new equipment."

The main difference in the viewpoints about the access to resources came from Bob. He pointed out that although the access at his middle school was good, "we consider ourselves to be fairly technology poor. We're still trying to acquire a lot of technology." This was an ironic statement since his school had more hardware and software programs than any of the other middle schools and the majority of the other level schools in the system. He was always on the search for more through grant applications and pilot programs. Even though pilot programs could create some short term logistical problems for the school and faculty, he felt the possible frustration was worth it because "it gives us a chance to get the technology we can't afford."

Establishment of a School Vision and/or Culture for Integration

The topic of a school vision and culture for technology integration had only one main area of agreement for the three leaders: there was no specific vision statement available at their school that related to technology integration or use. At no time was there a mention of the system technology plan or of the system vision statements for technology integration by any of the three leaders. Although there was not a specific vision statement available at any of these schools, each leader believed their teachers knew how they felt about technology or their expectations of technology integration and use. Holly believed that by giving teachers "the opportunity to use the computers, to do

those kinds of things" the teachers understood "that I value those things." Bob felt he possessed a strong background in and knowledge of technology, and that particular aspect of his leadership set a culture and "tone of expectation" among both the teachers and the leadership team that technology integration was an "expectation." Frank believed his teachers knew he thought technology was important because he and the school leadership team had "created that expectation that you be literate in technology" and had pushed "teachers to use tech in classrooms." Frank also admitted that even though his teachers knew that he "valued" technology integration, he could make that culture stronger if he "monitored use of technology more."

The components of each leader's vision for technology use and integration varied significantly. Holly's vision included the ideas that technology should be integrated seamlessly into the classroom, technology was a tool for the classroom teacher, and technology knowledge was important for students to have for success in future jobs. Bob believed technology was a "forced multiplier" that enabled one teacher to reach more students effectively, technology could improve a good teacher but made a bad one worse, and that the school leader must have to ability to monitor the teachers' use and correct it as needed. Frank believed technology was important and could be of assistance to students, but technology could not replace good teaching. He also believed all teachers should be technology-literate, even though at the current time, most students knew more about technology that did their teachers.

A vision of technology's effect on achievement and motivation of students was also perceived differently between the leaders. Holly thought it was possible that technology could have an influence on student achievement if they were able "to go to a

higher level of thinking" and "use technology and put it all together," but currently she had no evidence to prove that it did. However, she did think technology was a very positive influence on the motivation and attention of students in her school. Bob stated that he believed technology integration was producing positive effects on student achievement at his school but that effect was hard to measure, and although he was working on collecting data, he currently had no statistics to prove it. He believed the main impact had been "on our low-level students" because "with our remediation efforts, I think we see that as achieving, and if we have it [new technology implemented] for the entire year, I think we'll see more." He also believed technology had a positive influence on student motivation, especially those students who were considered low-performing or remedial. Frank stated that although it was possible technology had an effect on student achievement, there was no current data to prove such an effect. He also did not believe technology use was a motivating factor for the majority of the students in his school. He thought the current students were motivated if they're "an independent learner, where perhaps they're motivated to go off and do what they want to do with a computer, to create something, to research something ... but I think that's about 15 percent of the kids...that's not a lot."

Pressure and Incentives for Technology Integration

The school leaders' beliefs and behaviors concerning the provision of pressure and incentives were more similar between Holly and Frank than either of them was to Bob. Overall, both Holly's and Frank's description of their behaviors indicated there was no specific pressure to integrate technology; although, there was a tone of encouragement to do so. Bob, however, enacted specific pressures and expectations on his teachers for

technology use and integration. The main similarity between all three in this area of support was their assertion that they monitored and identified those teachers who were more proficient, and then they provided those teachers with new or more technology as it became available at the school. As Holly pointed out, she identified the high users and provided those teachers with the new technology because she believed "that's the key - to get it in there with someone who will use it…." Bob used informal observations to "identify the teachers that are technology users." As Frank received new equipment at his school, he researched to determine "who was doing the best with the technology that we had at the time, and I rewarded those teachers by giving them those pieces of equipment."

Three main areas categorized as pressure or incentive to integrate technology were the requirement of submitting technology-integrating lesson plans, observations of technology-integrating lessons, and teacher evaluations that included their technology integrating practices or skills. Holly and Frank both stated that they did not have a requirement for lesson plans, observations or evaluations. Holly stated that if she was doing an evaluation and the teacher integrated technology into the lesson, then "that's one more component of it and I note that in their evaluations." However, that was not in her purpose for evaluations and technology integration basically received "more informal observations than it is a formal thing." For his technology observations, Frank mainly asked his teachers to "tell me how they are using it" and did informal evaluations of use as he made classroom visits.

Bob's approach to lesson plans, observations, and evaluations differed from that of Holly and Frank. He stated that he expected his teachers to submit a minimum of one plan per week and those plans were evaluated by a "system of grading" and the LoTI

scale rating. Bob also stated that he and the other school leadership observed teacher's technology integrating lessons although there hadn't been a quota set for a particular amount on any grade level. He saw these observations of current technology use by teachers as setting up "a competitive environment" that encouraged more teachers to be bigger and better users. Observations and evaluations were both formal and informal, and those teachers with the most technology in their classrooms "are going to have all the evaluations for the technology because it's a resource they have." Tables 15.1 through 15.5 give a summary of the findings for each area of support for the individual leaders at each level.

Table 15.1

Provision of general support - leaders

	Elementary Holly	Middle Bob	High Frank
Support was present	X	X	X
Professional development strong	X	X	X
Match high users to equipment	X	X	X
Financial support strongest	X	X	
Time for teacher to plan, etc.	X		

Table 15.2

Professional development support – leaders

	Elementary Holly	Middle Bob	High Frank
Offered at school	X	X	X
Both required and optional	X		X
Leader attended	X	X	X
Modeling by leader or teachers present/effective	X	X	X

Table 15.3

Access to resources – leaders

	Elementary Holly	Middle Bob	High Frank
Access overall good to excellent	X	X	X
IIS support good	X		X
Sufficient technology in classrooms	X	X	X
System level support good	X	X	X
Computer lab access good	X	X	X

Table 15.4

School vision and/or culture for integration – leaders

	Elementary Holly	Middle Bob	High Frank
No specific vision statement	X	X	X
Teachers know leaders feelings/expectations	X	X	X
Positive influence on student motivation	X	X	
Possible positive influence on achievement but no data	X	X	X

Table 15.5

Pressure and/or incentives for integration – leaders

	Elementary Holly	Middle Bob	High Frank
Informal evaluation to match technology to teachers	X	X	X
No specific pressure or incentives	X		X
No lesson plans required	X		X
No observations required (except special cases)	X	X	X
More evaluations informal than formal	X	X	X

Cross Case Analysis – Teachers

The school teachers were interviewed to discover their beliefs about the role that school leadership plays in teacher integration of instructional technology and also how they described the support they received from school leaders for their integration of technology in the classroom. The teachers were Pam and Tamara from the elementary school, Susan and Paul from the middle school, and Hal and Terry from the high school.

Provision of General Administrative Support for Teachers

All six of the teachers interviewed agreed there was general administrative support provided for technology integration at their school. Susan, at the middle school level, further classified that support role as "hypo-technology" and expressed, "It's expected of us. It is mandated to us, and they do offer you help but there's not tolerance for not using it," while Paul saw that same support role as "strong," stating the leadership "believed highly in the use of technology." There was no other area of consensus between all six teachers. The elementary and middle school teachers all believed the support provided by the leadership needed to be differentiated yet equitable for the specific needs and skill levels of the various teachers, which included the leadership implementing more pressure and training for some teachers. As Susan put it, it was an important role for the leadership to "evaluate the expertise of the teachers" before implementing more requirements. Tamara stated that she thought "the leadership has to open the door and invite people to come in sometimes by requiring them to take certain courses and certain staff development hours."

Tamara, Susan and Paul all believed the strongest area of leadership support was financial resources, while Hal and Terry believed the strongest area was the provision of

professional development. Paul even believed his principal went above and beyond to obtain financial support because they were writing different grants to try to "obtain outside funding to help us." In her perspective, Pam saw the ITS, not the principal, to be the true technology leadership support at her school, as she stated, "we have a wonderful technology specialist…the last two years we've had complete support from out technology leader here." Pam, Tamara and Terry all believed there was a need for the leadership to provide more time to the teachers for learning to use new technology and planning with other teachers to implement that technology in an effective instructional manner. As Pam expressed, "Time - and that's probably the answer you would get from everyone that you know… I just don't have enough time to do as much as I'd like to do with it." Tamara also believed there should be a school plan for technology integration, emphasizing a need for an "overall plan for the school, especially when you're talking about staff development and having enough planning time for the individual teachers."

The most effective classroom use of technology was different for most of the teachers. The only two to be in agreement, Pam and Tamara, believed their most effective use included the interactive white boards. Pam stated, "You can do so many things with it. It's just an interactive tool. You can use it in every subject…the students "think it's cool and they pay attention to it better." Tamara agreed with, "it's something that I can easily prepare for ahead for the students" and can use "in conjunction with textbooks but with other materials as well." Susan believed the most effective use was "having the students use it as a tool to show a product that they have created from the knowledge that they have learned." Paul's most effective use was the "ability to bring in external sources," for instruction. Graphics for presentations and "all the pictures that I can make

available" was Hal's most effective use. Terry believed the graphing calculators were the most effective use in her classroom.

Provision of Professional Development Opportunities

There was agreement between all six teachers that professional development opportunities for technology integration and use were provided at their school. The elementary and high school teachers stated the professional development was classified as both required and optional, while the middle school teachers stated the professional development at their school was all required. Five of the six teachers also believed that the professional development offered was not always of the best quality or actually effective for what they needed to know or learn to do. As Pam stated, "I know that the [course] is supposed to kind of help with that [technology use], but I don't know if it does, if it gives them enough instruction, or if it's more or less you're kind of doing your own work."

All of the teachers except Terry believed there was a need for more relevant and on-time professional development and training for technology integration. Pam believed more was needed to address "the specific needs of teachers, even if they don't have an ActivBoard® or don't have certain things. I think maybe sending them to some workshops or having a workshop here at a faculty meeting or something would help." Susan thought that professional development "might need to be more individualized, like at a grade level meeting. We're doing *this* specifically." Hal summed that perspective by stating, "Let me decide what I want - I know that we don't need more programs…I want it to be available but not to be required."

Pam, Paul and Hal also believed there was a need for more review of what had been taught before as they were implementing learned strategies. Pam suggested, "Maybe something just to keep things fresh. I mean there are things that I've done, but I've even forgotten - if you don't practice it you don't remember it." Paul stated he needed additional review on "basic software things like Excel® - I think there's a ton of stuff that you can do with Excel but I don't know how to do those. I'd like to get training on that." Hal stated that, in regards to the courses he had participated in, he could "remember how to do it for a little while, but unless you are using it all the time it goes away, and when I start a new project I have to go to the ITS and refresh how to do that anyways." In contrast, Terry believed her needs for professional development had been supported and met, and that she really didn't need any more training at this time because she believed "many of us are trained on the software we use."

The elementary and middle school teachers believed the majority of the professional development currently taking place in their schools was based on more administrative uses than instructional uses of technology. Tamara shared that the current technology training available at the school focused on programs that were teacher-centered and administrative in use and "less on integrating it into the school." Pam, Tamara and Paul also believed there was a need for more professional development for those teachers who were low users. Tamara stated it was her belief that "we're going to have to have more staff development to show people the possibilities" because "for the most part technology is not a cornerstone most of the time. I think it probably should be more. We have resources that are underused and underutilized. There are still not enough people."

Tamara and Paul, who would both be classified as high-users of technology, both mentioned the need for the modeling of integration strategies. The difference was that Tamara wanted more modeling for herself, while Paul felt other teachers needed to see more modeling to encourage their use. Tamara stated that she desired to see modeling that demonstrated "how it's really utilized in the classroom - I think that would be really good…Just knowing how that works, seeing a model of how that works in another school or even in another grade level, I think would be really good." In Paul's view, modeling would be effective because "once the teachers start getting a taste of it and they see it used in other classes they say, 'Oh, wow, that looks really great - I could really use that in my class'" and then they would pursue and show more interest learning about technology.

Although the teachers saw the need and support for professional development, the views of professional development supported and provided by the school leadership were not extremely positive overall. Susan offered one of the strongest criticisms of school professional development with

> I think as far as I would be concerned, there are specific questions about things that I would like to ask, but it's assumed that you already know that. Sometimes you feel uncomfortable asking someone because you're embarrassed that maybe you should already know this, but you still have to ask because you have to use it, and there's this aura of if you don't know technology that you're behind the times or something's wrong with you.

Provision of Access to Appropriate Resources

The teacher participants held differing perspectives on the access provided to appropriate resources by their school leadership. The elementary teachers believed the overall access to hardware and software at their schools was good, and the middle school teachers believed their access was excellent and better than other schools. Paul thought

his school leadership was "taking strong actions in getting it in there, just not as fast as they would like." However, the high school teachers believed the access was limited and less than other schools. Hal recognized that "there are some roadblocks economically, etc. and that does get in the way" of getting all the hardware the teachers needed, but he also believed "the implementation depends on the availability of technology in the classrooms."

In relation to the access to resources that each teacher had in their individual classrooms, the perspectives were slightly different. Both of the elementary teachers and Paul at the middle school had interactive white boards in their classrooms, but they also recognized that their access was not true of all teachers in the school, as Pam acknowledged that having such equipment put her "a step above everyone else." Neither Susan at the middle school nor either of the high school teachers had interactive boards in their rooms, and all three of them also felt their classroom access was lacking. Hal was slightly frustrated with his school's lack of the interactive boards and similar resources because he knew "some of the new schools are getting tons of Smart Boards®, but I think we still only have three or four - no, two or three or something like that, in the whole school."

The beliefs concerning computer lab access also varied among the different teachers, even at the same school. At the elementary school, Pam believed the computer lab access was good. Although Tamara could get physical access, she still saw the need for the lab to be upgraded. In her view, "access for me is becoming limited only because the technology is beginning to age based on the amount of use it's had." At the middle school, Paul believed computer lab access was very good while Susan saw her access as

limited. Susan's "off-team" gifted education position limited her access, and she explained, "If you are on a team you have tremendous access to the labs….Due to my unique situation, I'm not necessarily in the schedule. We do have some computers in our classrooms, but on a team they have tremendous use." Both Hal and Terry at the high school believed the computer lab access there was limited, and Terry clarified that belief with, "We're 1600 strong and we have one lab… Accessible … I'd put a bad mark on that one."

All of the teachers believed there was a need for the acquisition of more hardware for the school, even if the current level of access was seen as good or higher. Pam believed her school leader was trying to obtain more resources for the school even within the budget limitations, and she pointed out that her school leadership did "work hard at the budget meetings…and [they] ask for more things and they do what they can to get them." Tamara stressed the need for more of "the actual physical hardware that we can use is critical because if you don't have enough sharing, just isn't always possible, not when you're trying to maximize the time in the school day." Both Susan and Paul believed the main focus of their school leader was to acquire more resources, especially hardware, and Paul stated that grant writing was a key aspect of that goal to "obtain outside funding to help us."

Both the elementary and high school teachers believed the personnel support provided by the leadership via the school ITS was very good to excellent. Pam described her school ITS as "very helpful" and "super, super wonderful" as she was "constantly trying to find new things for us to do in our classrooms." Terry believed the school ITS was "fabulous" and that he provided "very good support" to the teachers in the school,

and Hal echoed that belief by stating that the school ITS was "great, and any time we need something or help operating something, it's there." However, neither of the middle school teachers made any mention of their school ITS.

Establishment of a School Vision and/or Culture for Integration

The support category of a school vision and culture for technology integration had only one main focus of agreement for the six teachers: there was no specific vision statement available at their school that related to technology integration or use. At no time was there a mention of the system technology plan or of the system vision statements for technology integration by any of the six teachers. Although there wasn't a specific vision statement available at any of these schools, each teacher believed their leaders were supportive of technology integration and use in some manner. The elementary and high school teachers all had a "feeling" the leadership had a vision for integration. As Pam put it, "I don't ever really hear them say here or there about technology, but I do know that they do like it and do want our kids to experience it." Terry also stated, "I don't know that a technology statement has been made as a vision statement, but you have the feeling that the students will prosper with as much technology as is possible." However, the middle school teachers believed it was clear that technology was very important to their school leader. As Susan put it, "Our administration is what I would call hypo-technology… It's a daily thing. It's expected of us. It is mandated to us."

As far as the school leader having an effect on the teacher's personal vision of integration, none of the elementary or high school teachers believed their leader had a direct influence on them. At the middle school, Paul saw his school leader as a model of a

high-user and one to emulate. In fact, his gaining of the technology he currently had in his classroom was "a great surprise, and that definitely came from the top down as from the administration. I didn't pick my vision." In a counter view, Susan saw that same leader as "hypo-technology" and one who was somewhat obsessive and intimidating, and felt her view of technology had changed from more positive to it being more of an "albatross being hung around my neck."

The components of each teacher's beliefs of what their school leader's vision was for technology use and integration varied. Tamara believed the school leader "wanted it to be integrated throughout in order to do things like raise student achievement and definitely increase student motivation," and Pam thought technology in the school could give "kids a chance to see what they're going to be doing in the real world." Paul also saw the vision as preparing students for their future because "now it's computers and different kinds of technology, and they need to be proficient on them if they are going to have job skills in the future. For gainful employment in the future they are going to need to be very proficient in technology." He also believed the school leader envisioned increasing integration throughout the school by "targeting teachers that are more technologically proficient to introduce it to the school." Terry saw the overall school vision as "that we use technology and use it efficiently." Hal saw the leadership vision as to "equip us with more" technology and to eventually "have the technology available to the teachers."

A vision of technology's effect on achievement and motivation of students was also perceived differently between the teachers, even within the same school. Only Pam believed without doubt that technology integration in the classroom had a positive effect

on student achievement. Tamara "instinctively" felt like technology was helping student achievement, but acknowledged "I really don't have clear data and that's what I'd like to have - some clear data that says that students are doing better because of this." Paul echoed the lack of data by stating he thought technology use may have some affect on the student achievement but it was "hard to measure the achievement." Susan said she didn't know that it was "absolutely, positively necessary" that technology be "integrated into every single lesson that we do in order for them to have high achievement." Both Hal and Terry believed technology could have a positive influence on student achievement, although in slightly different perspectives. Hal perceived student achievement a result of the visual stimulation, and Terry saw student achievement related to increased problem solving skills.

As far as student motivation was concerned, Pam, Tamara, and Paul all believed technology had a positive influence. As Paul pointed out, "technology really, really helps with keeping the students engaged, and you know who's not on task immediately, and you can get them back into the game, so to speak." Susan, Hal and Terry were not as certain of technology's positive influence on student motivation though. Terry summed up those thoughts with

> It varies from student to student. I think that when maybe, even ten years ago, it was very much a motivator. There is so much technology out there now it's not as new. It's more of an expectation and less of a motivator than it was in the past.

Pressure and Incentives for Technology Integration

The teachers' beliefs concerning their school leaders' provision of pressure and incentives were more similar between the elementary teachers and the high school teachers than between any of those teachers and the middle school teachers. Overall, both

the elementary and high school teachers believed their leaders' words or behaviors did not indicate there was any specific pressure to integrate technology; although, there was a tone or feeling of encouragement and support to do so. As Pam remarked, "I don't ever really hear them say here or there about technology, but I do know that they do like it and do want our kids to experience it." The middle school teachers, however, believed their school leader definitely enacted specific pressures and expectations on his teachers for technology use and integration. As Susan commented, she thought her leadership believed "that everything has to be technology oriented" thought she thought the reality was "…you're technology or your not."

Three main areas categorized as pressure or incentive to integrate technology were the requirement of submitting technology-integrating lesson plans, observations of technology-integrating lessons, and teacher evaluations that included their technology integrating practices or skills. Both the elementary and high school teachers stated that they did not have a requirement for lesson plans. The middle school teachers agreed there was a requirement for lesson plans, though their comments about that requirement were different. Susan stated that teachers were designated to write a "certain amount of technology lessons" and submit them to the ITS, which she had always done; however, she only assumed "that they [teachers] are checked for that, but I don't know for a fact." Although Paul did not mention a specific technology requirement for all teachers' lesson plans, he did declare that "every day I'm using technology as part of my lesson plans."

Pam, Susan, Hal and Terry all stated there was not a requirement for observations for them using technology in the classroom. Pam commented, "I can't speak for the whole school, but I don't think they have ever said, "…let me come see what you're

going to do with your technology and computers today." Tamara acknowledged that she was observed using the special equipment she had in her classroom, but it was done at her convenience. The leader had requested Tamara to provide a time she would be doing a specific technology-integrating lesson because "they wanted to make sure that they came in and saw a time when I was using the ActivBoard® and we were using laptops." She did not know of other teachers being observed specifically for their technology integration. Paul also said he was observed for his technology integration due to the equipment he had in his room, and that his school leadership had "people come in my room to see what we're doing in here. Our principal brings people down there pretty regularly to show off the technology that we have that we're using and shows them how it gets the kids engaged."

None of the six teachers knew of an expectation to have their technology integration skills included in their teacher evaluation or to be a part of any other evaluation requirement. Hal considered, "They probably do some form - but I really don't know." Paul did think the future might bring changes because "at that point it [technology integration] may become more of an evaluation item, whether they're [teachers] using it or not"

In regard to other methods of pressure or incentives, Pam, Tamara and Susan believed the teachers' computer lab use might be monitored because it had been mentioned by either the school leadership or the ITS, but none of them had any evidence to support that possibility. Pam had been told by the ITS that when a teacher signed up to use the different technology and labs in the school "there's a record kept of that, just to

monitor the amount of use of different things like the laptop lab or the projects lab, but to evaluate individuals on - I don't know that they do."

Paul stated that he believed the provision the 21st Century Classroom equipment to his and a few other selected teachers classrooms was intended to provide incentive for other less-proficient teachers to become higher users of technology integration, and he thought this situation "kind of encourages the teacher, 'Well, maybe I should start implementing those technologies in my room." Terry was the only teacher to mention any specific type of incentive program, and she stated her school leader encouraged and supported participation in the Outstanding Technology-Integrating Teacher of the Year award at both a monthly school and yearly system level. None of the teachers mentioned a specific process the school leadership used to identify the teachers who would receive any new hardware as it came into the schools. Tables 16.1 through 16.5 give a summary of the findings for each area of support for the individual teachers by each level.

Table 16.1

Provision of general support - teachers

	E.S. Pam	E.S. Tamara	M.S. Susan	M.S. Paul	H.S. Hal	H.S. Terry
Support was present	X	X	X	X	X	X
Need differentiated support	X	X	X	X		
Financial is strongest	X	X	X	X		
Need more time for planning, etc.	X	X		X		

E.S. – Elementary School M.S. – Middle School H.S. – High School

Table 16.2

Professional Development Support – teachers

	E.S. Pam	E.S. Tamara	M.S. Susan	M.S. Paul	H.S. Hal	H.S. Terry
Offered at school	X	X	X	X	X	X
Both required and optional	X	X			X	X
Not always effective or comfortable	X	X	X	X	X	
Need on-time and relevant	X	X	X	X	X	
More administrative vs. instructional	X	X	X	X		
More needed for low users	X	X	X	X		

E.S. – Elementary School M.S. – Middle School H.S. – High School

Table 16.3

Access to resources – teachers

	E.S. Pam	E.S. Tamara	M.S. Susan	M.S. Paul	H.S. Hal	H.S. Terry
Some access present	X	X	X	X	X	X
Need more in school	X	X	X	X	X	X
Need more in own classroom			X		X	X
ITS support good	X	X			X	X

E.S. – Elementary School M.S. – Middle School H.S. – High School

Table 16.4

School vision and/or culture for integration - teachers

	E.S. Pam	E.S. Tamara	M.S. Susan	M.S. Paul	H.S. Hal	H.S. Terry
No specific vision statement	X	X	X	X	X	X
"Feeling" it is important	X	X	X	X	X	X
Positive influence on achievement	X				X	X
Possible positive influence on achievement but no data		X	X	X		
Positive influence on student motivation for all	X	X		X		
Students need tech for the "real world"	X	X	X	X		
Leader not a direct influence on personal vision	X	X		X	X	

E.S. – Elementary School M.S. – Middle School H.S. – High School

Table 16.5

Pressure and/or incentives for integration – teachers

	E.S. Pam	E.S. Tamara	M.S. Susan	M.S. Paul	H.S. Hal	H.S. Terry
No evaluations required	X	X	X	X	X	X
No observations required	X	X	X		X	X
No overall specific pressure or incentives	X	X			X	X
No lesson plans required	X	X			X	X
Unsure of lab monitoring	X	X	X			

E.S. – Elementary School M.S. – Middle School H.S. – High School

Research Questions

The cross case analysis of qualitative interviews with the three leaders and the six teachers was used to address four research questions. Those questions were:

1. What are school leaders' beliefs about the support role they play in teacher integration of instructional technology?
2. What are teachers' beliefs about the support role that school leadership plays in teacher integration of instructional technology?
3. How do school leaders describe the support they provide for teacher integration of technology in the classroom?
4. How do teachers describe the support they receive from school leaders for their integration of technology in the classroom?

The analysis supported the overall support categories referenced in the literature and pilot study results: (a) provision of general administrative support for teachers, (b) provision of professional development opportunities to increase knowledge about computers and integration, (c) provision of access to appropriate resources, (d) establishment of a school vision and/or culture for integration, and (e) provision of pressure and incentives for integration. However, it was in the details and descriptions of the beliefs, perspectives, and behaviors of support that similarities and differences between the leaders and teachers were found.

Questions 1 and 3 addressed the school leaders' beliefs about the support role they played in teacher integration of technology and their descriptions of the support they provided for teacher integration of technology in the classroom. Questions 2 and 4 addressed the teachers' beliefs about the support role their leaders played in teacher integration of technology and their descriptions of the support leaders' provided for teacher integration of technology in the classroom. Since educational beliefs and behaviors are intertwined (Pajares, 1992), these questions will be addressed and discussed through the pairing of these questions about the leaders and teachers.

The leaders all believed they provided general administrative support for teacher integration of technology through providing professional development to the teacher, matching the high-user teachers to new equipment as it was received, and providing financial support to obtain new hardware and/or software. Only one leader mentioned the need for teachers to have time to plan for technology integration, and she believed she had provided that time. Although the teachers all agreed there was general leadership support for technology integration, only two felt the professional development support

was quality, four believed there was a need for differentiated support for the high and low users (as opposed to a favored support to high users), and half mentioned the need for more time to plan for integration and did not feel it was currently provided. One teacher even stated the real leader for integration was the school ITS, not the identified school leader.

The leaders all believed they provided their teachers professional development opportunities to increase knowledge about computers and integration, and that professional development was of quality whether it was required or optional. They also believed they demonstrated their support by attending such professional development, with one principal even leading some of the sessions. They also felt they provided teachers opportunities for the modeling of effective integration practices. The teachers agreed that both optional and required sessions of professional development was provided by the leaders, but most saw that professional development as not always effective, they felt there was a need for more on-time and personally relevant sessions, and they also desired review sessions as needed. Most also saw the current professional development being provided as for more administrative uses than for instructional uses of technology.

The leaders believed they provided access to appropriate resources for their teachers. They all believed that access they had provided was overall good to excellent, sufficient technology was present in the teachers' classrooms, access to computer labs was good for all teachers, and that the ITS provided a good support element at their school. The teachers all felt there was access provided to resources at their school, but only two felt the overall access was good and all mentioned a need for more resources

both in the school and in the classrooms (three felt they had good classroom access but recognized other teachers' need for more). Most felt computer lab access was limited in relation to their need. Although four of the teachers mentioned the ITS as being a good support provided, two of the teachers made no mention at all of the school ITS supporting them.

The leaders all believed they had established of a school vision and/or culture for integration at their school. Although none of them had a written statement available, they believed their teachers knew their feelings and expectations about technology use and integration. All three also believed technology was a possible influence on student achievement but that there was no hard data to support that belief. They also believed technology had the ability to be a positive influence on student motivation, though one felt that motivational influence was limited to a small sub-group of students. Only one leader believed he modeled good or high use of technology, and one mentioned the students' need for technology for their future careers. The teachers all stated there was not a written or identifiable statement of a school vision of the use of technology; although, most believed there was a "feeling" it was important at their school. Thus, to some degree the school culture concerning the importance of technology was communicated. However, the vision for integration was not apparent to the teachers. Most did not believe their school leader had been a direct influence on their personal vision of technology integration. Half of the teachers believed technology was a positive influence on student achievement, while the other half believed it was a possible positive influence but there was no data to support that belief. Half also believed technology was a positive influence on student motivation, two others felt it could be a motivation for some

students, and one saw that motivating feature as being manifested in a potentially negative manner. Most of the teachers believed the students would need technology for their future careers and the "real world." Only one teacher stated his leader was a model of good or high use and another teacher felt that same leader was actually intimidating to teachers when it came to technology use.

The leaders believed they provided pressure and/or incentives to their teachers for technology integration. All three stated they researched and monitored teachers' technology use in their school to assist them in matching the strong or high users with new equipment as it became available but that this monitoring or evaluation was more informal than formal. Only one leader conducted formal observations of technology integration and that was only of teachers who had high-end equipment in their classroom. That same leader was the only one to also state that there was a definite pressure and expectation for use and integration at his school and that lesson plans were required on a regular basis. In contrast, none of the teachers knew of an evaluation process in place by the leadership for teacher technology integration and only one knew of being observed for technology use. Most believed there was no overall specific pressure or incentive for technology integration nor was there a requirement for lesson plans to include technology integration in place. Half thought computer lab use might be monitored but did know have any evidence to verify that thought. The two teachers who mentioned a definite pressure and expectation and required lesson plans were from the same school as the leader who identified those practices; however, the teachers had not received any feedback on their lesson plans and one felt the high level of pressure had only served to make her beliefs about technology integration more negative instead of positive.

Summary

Both similarities and differences were found in the leaders' and teachers' beliefs about the leaders' support role and the support provided by leaders to teachers for integration of technology in the classroom. These similarities and differences were identified in the preceding section. Chapter 9 provides a discussion of the main similarities and difference found between the leaders and teachers as well a relationship of the finding of this study to the literature. Implications for further study are also discussed.

CHAPTER NINE

SUMMARY, DISCUSSION AND IMPLICATIONS

This study was based on the premise that the role of school leaders is crucial to successful classroom technology integration. The study was rooted in the theoretical assumptions espoused by Pajares (1992) concerning the effects of beliefs on educational practices. The purpose of this mixed methods case study was to investigate the beliefs of school leaders and the teachers concerning support factors that affect technology integration. The guiding questions for this case study were:

Is there a difference between the school leaderships' beliefs about classroom technology integration and the teachers' beliefs about classroom technology integration? If so, what is the essence and nature of those differences?

Summary of Research Design and Findings

This study used a two-phase, sequential mixed-methods case study to obtain statistical, quantitative results on beliefs concerning support factors that affect technology integration using a survey with a sample population, and then followed the survey with individual interviews of key informants to explore those results in more depth.

In the quantitative analysis portion of this mixed methods study, the MANOVA test found significance, with the school leaders being notably more optimistic than the teachers that these factors would occur. Follow up tests revealed that differences were statistically significant in all four conceptual categories of support of general

administrative support, professional development opportunities, access to appropriate resources, and the establishment of a school vision and/or culture. Although the differences were small, they were real. Further analysis identified the three extreme case schools from which a diverse group of interview participants of both leaders and teachers was selected for the qualitative portion of this study.

Interviews were conducted to further explore the school leaders' beliefs about the support role they played in teacher integration of technology and their descriptions of the support they provided for teacher integration of technology in the classroom. These interviews also to explored the teachers' beliefs about the support role their leaders played in teacher integration of technology and their descriptions of the support leaders' provided for teacher integration of technology in the classroom. Findings from the qualitative analysis upheld the four conceptual support categories addressed in the survey and also a fifth category referenced in the literature. These categories were the following: (a) provision of general administrative support for teachers, (b) provision of professional development opportunities to increase knowledge about computers and integration, (c) provision of access to appropriate resources, (d) establishment of a school vision and/or culture for integration, and (e) provision of pressure and incentives for integration. In review, the quantitative survey analysis identified a statistical difference between leaders and teachers in factors concerning support of technology integration, but it was in the details and descriptions of the beliefs, perspectives, and behaviors of support discussed in the interviews that the essence and nature of the differences and similarities between the leaders and teachers were further elaborated on and explained.

Discussion

Extrinsic first-order barriers and intrinsic second-order barriers can prevent teachers from being successful with technology integration. Research indicated that school leadership that reduces or removes first and second order barriers was an imperative piece of the integration puzzle if teachers were to move toward successful classroom technology integration (for example, Ely, 1990a; Kozma, 2003; Sandholtz et al., 1997). Educational and instructional behaviors of both the school leaders and the teachers are related to their beliefs (Kagan, 1992; Parajes, 1992). It has been noted that motivational beliefs and teachers' perceptions of administrative support mediate administrative efforts to influence teachers' use of computers (Dusick, 1999).

This study sought to inform understanding of the existence and nature of second-order barriers through examining responses and comments school leaders and teachers made about first order barriers (Ertmer, 1999; Ertmer, 2005). Quantitative and qualitative analysis revealed differences in beliefs of school leaders and teachers concerning support factors that affect technology integration. These findings are discussed in relationship to the literature by each identified category of leadership support.

Provision of general administrative support for teachers

The school leaders all believed they provided general administrative support for teacher integration of technology, and the teachers all agreed there was general support provided to them for technology integration. However, both the survey and interview analysis indicated the leaders were more positive in their beliefs about that support than were the teachers. The existence of and need for various aspects of general support such as training or professional development in technology integration (Ely, 1990b; Kozma,

2003), observation and evaluation of teacher use (Bernal, 2001), financial support for resources (Ertmer et al., 1999; Miller & Olson, 1994), and time for planning for technology use (Garthwait & Weller, 2005; Kozma, 2003) were supported by the findings. All of these various aspects were identified and/or described by leaders and teachers as important support factors related to classroom technology integration, but the leaders believed these aspects were stronger, more positive, and more prevalent at their schools than did the teachers. It is probable that the leaders truly believed they were effectively supporting technology integration in these modes, and if the teachers did not voice a direct complaint to them concerning these particular issues, they assumed all was well. It is also possible the leaders were taking actions they believed were supportive but that were not being communicated clearly or at all to their teachers. However, as Ely (1990b) reported, in order for an endeavor such as technology integration to be successful, leaders should continually communicate their enthusiasm for the innovation in a manner that the teachers understand as supportive to their efforts.

It is essential that teachers be cognizant of and recognize the leader's support efforts. In one case, the leadership support was seen as such a passive role that the teacher even stated the real leader for technology integration was the school ITS, not the school principal, the designated school leader. Although having a full-time instructional technology support person has been identified as an effective component to influence teacher technology use (Vockell & Sweeney, 1994), this individual should probably not supersede the school principal as the technology leader in the eyes of the teachers. This relates to Kozma's (2003) findings that a strong and supportive style of leadership, rather

than a passive or neutral role, was more likely to result in sustaining an innovation such as technology integration over a greater length of time.

In addition to these other aspects, half of the teachers mentioned the need for more time to practice using the technology, plan technology integration lessons, and collaborate with peers. This emphasized their need for such time to be set aside with a technology integration focus. Although these needs often identified in research (Dwyer, 1995; Ertmer, 1999; Garthwait & Weller, 2005; MacNeil & Delafield, 1998), the teachers believed they were not being addressed effectively or at all by the school leadership.

Provision of professional development opportunities

The survey analysis determined that the school leaders believed professional development was more likely to enable teacher technology integration and that quality professional development for the teachers was more likely to occur than the teachers believed it would be. These findings were supported by the interview analysis as the leaders all believed they provided their teachers quality professional development opportunities to increase knowledge about computers and integration. The leaders also demonstrated their support by attending that professional development, with one principal even leading some of the sessions. Although Feldner (2003) found that modeling and leading professional development by the school leader was an important factor in teacher integration practices, it may not be a very positive factor if the teachers perceive that professional development as ineffective, irrelevant, or unneeded at that time, which was how most of these teachers saw their current professional development. In fact, poor professional development has been shown to impede teachers' use of technology for delivering instruction (O'Dwyer, Russell, & Bebell, 2004).

Most of these teachers also described the content of current professional development as administrative uses of technology rather than instructional uses of technology, and most of the teachers believed technology should be used to improve instructional practices. They also believed that their technology training needs and wants were not necessarily being met by the current professional development offerings and/or requirements. It may be that there is a need for closer alignment between the teachers' needs and perceived importance of technology-centered professional development and the time that is spent on particular content or topics, an important aspect of successful school technology implementation as indicated by MacNeil & Delafield (1998). There has also been a system-wide focus in the past year for training leaders and teachers how to use of technology to analyze and disaggregate test scores rather than a focus on how to improve technology integration into the curriculum and classroom teaching. It may be that the leaders themselves need more training focused on integrating technology into the curriculum in addition to administrative uses. This relates to Dawson & Rakes (2003) findings that school leaders who received training focused on integrating technology into the curriculum led schools to integrating technology in more student-centered lessons than those receiving any other types of technology training.

Finally, both leaders and teachers mentioned either the existence of or need for professional development in the form of effective modeling of integration practices by either the leaders or peer teachers. The teachers believed there was not sufficient or quality opportunities to observe appropriate modeling of practices or time to practice those changes to which they had been exposed, an activity they felt would help with their integration growth. This supports Ertmer's (2005) statements that without the use of

additional strategies to encourage the adoption process of technology integration, such as providing opportunities to examine new practices supported by new beliefs, providing teachers with successful experiences with small instructional changes before attempting larger changes, and giving access to models of how to enact specific classroom strategies, there is little reason to expect that teacher will move from low-level uses to higher-level uses. At the very least, teacher confidence and competence must be built before it one can expect any change in beliefs to occur.

Provision of access to appropriate resources

The leaders all believed they provided access to appropriate resources in both the classrooms and computer labs for their teachers and they rated that access as good to excellent. These leaders seemed to believe they were lessening the burden on the teachers by dealing with the outside issues such as funding, upgrading and support. This is similar to what Kozma (2003) determined in his findings about supportive technology leadership. With the inclusion of the ITS, whom the leaders believed provided a good support element at their school, they were possibly also trying to reduce first order barriers to technology integration such as limited access and lack of technical support, two necessary aspects of leadership support for technology integration identified by Sandholtz et al. (1997). Although the teachers all felt there was some level of access to resources provided at their school, they all also mentioned a need for more resources both in the school computer labs and in the classrooms for either themselves or their fellow teachers. If these teachers, even those who had relatively high access to resources, still believed there was a lack of access to computer and software in their school, then perhaps, in their mind, a first order barrier to integration had yet to be removed (Ertmer, 1999). Although

four of the teachers mentioned the ITS as being a good support provided, two of the teachers made no mention at all of the school ITS supporting them. This perceived absence of a patient and expert technology support staff could also have a negative affect on the integration efforts of a teacher, especially if she already perceives other barriers obstructing her progress (Morton, 1999).

Provision of a school vision and/or culture for integration

The leaders all believed they had established of a culture for technology integration at their school. Although none of them had a written vision statement concerning technology integration, they believed their teachers knew their feelings and expectations about technology use and integration and understood the school culture they had set for integration. Having a supportive school culture is important, and Loague (2003) found that school culture was the key to integrating technology into instruction. In addition, a school culture perceived by teachers as nurturing technology use and innovation will encourage the use and integration of technology (Lan, 2001).

Although most teachers believed there was a “feeling” technology was important at their school, all of them stated there was not a written or identifiable statement of a school vision of the use of technology. Most did not believe their school leader had been a direct influence on their personal vision of technology integration. Even if there was a “feeling” that technology was important, that might not be enough to support the instructional changes necessary if technology and information access are to transform the traditional classroom roles of teachers and students. Pierson (2001) proposed that technology integration be locally defined as part of the school vision in a manner understood by all stakeholders so integration can be planned for, implemented, assessed,

and generally understood. In addition, Sandholtz et al. (1997) stated that leaders need to work with their teachers to create a shared vision of the future, to ease tensions and foster collaboration rather than competition, and Hohensee (1998) stated that teachers who had input into creating a school vision for technology integration and helped create goals for its use were more likely to take initiative to use computer technology in instruction. The findings of these researchers support the need for school leaders to have in place a school vision for technology integration that teachers have had an active role in creating, a situation that obviously had not occurred at the schools to this point in time. In addition, creating this vision with beliefs in mind is also very important because, as Winschitl and Sahl suggested, there "can be no institutional 'vision of technology use' that exists separately from beliefs about learners, beliefs about what characterizes meaningful learning, and beliefs about the role of the teachers within the vision" (p. 202).

Beliefs that computers are beneficial for both the student and the teacher are important in defining the school culture and vision of technology integration (Dusick, 1999). All three leaders believed technology was a possible influence on student achievement but that there was no hard data to support that belief. Half of the teachers believed technology was a positive influence on student achievement, and while the other half believed it was a possible positive influence, they felt they had no hard data to support their belief. Fulton and Torney-Purta (1999) found teachers used technology to support the kinds of teaching practices they believed to be effective to meet the current expectations of student performance. All three of these schools were focused in student achievement as related to student performance on state-mandated tests that focused on basic core content information mostly defined at the knowledge and comprehension level.

If it is more important that test scores be at a certain level than students be involved in innovative technology-based projects, these beliefs about instruction and student achievement could be a significant inhibitor to innovative integration practices if teachers and leaders do not believe the gains in student performance do not justify the investment of time and effort in computer use or the potential benefits of computer use is not as important as other needs, i.e. preparing for a test or exam (Fuller, 2000). If leaders and teachers do not fully believe that innovative, student-centered constructivist technology integration can positively influence student achievement, they may be less likely to implement such practices. This is supported by Becker and Riel's (1999) findings that teacher practices and beliefs are continually fashioned by their experiences in teaching, the opinions and values expressed by those around them, and by the expectations of those they consider influential, all of which are transmitted through by formal and informal rules, norms, and procedures, all of which are part of school culture. Changing second-order barriers such as beliefs may require the basic school culture or vision to be revised regarding what defines content and content coverage, how to identify student learning and engaged time, and how to define teaching behaviors (Ertmer, 1999).

Sandholtz et al. (1994) found that students in classrooms where technology was being integrated are often more focused and motivated than those in a traditional classroom. Although the school leaders in this study believed technology could possibly be a positive influence on student motivation, one leader felt that motivational influence was limited to only a small sub-group of students. In addition, only half of the teachers believed technology was definitely a positive influence on student motivation; two others felt it could be a motivation for some students, and one saw that motivating feature as

being manifested in a potentially negative manner. The perception of technology not having much of an effect on student motivation may hinder the teachers' desire to use technology in the classroom, or perhaps this perceived or actual lack of student motivation with technology use may be a result of the maintenance of traditional teacher-centered teaching practices rather than the technology use, or lack thereof. This would support Peck, Cuban, & Kirkpatrick's (2002) findings that teachers most frequently used technology to support, rather than alter, their existing teacher-centered practices rather than constructivist, computer-based projects, and teacher-centered activities may be less motivating to students than are student-centered activities.

Provision of pressure and incentives for integration

The leaders believed they provided either pressure or incentives or both to their teachers for technology integration through formal and/or informal evaluations and observations. These assessments were sometimes used to determine which teachers received new technology coming in to the school. Only one leader stated there was a "definite" pressure and expectation for use and integration at his school and that lesson plans were required on a regular basis. Only one leader had an incentive plan in place of which the teachers were aware. In contrast, none of the teachers knew of an evaluation process in place by the leadership for teacher technology integration and only one knew of being observed for technology use. Most believed there was no overall specific pressure or incentive for technology integration nor was there a requirement in place for lesson plans to include technology integration.

This difference in beliefs and behaviors as perceived by the leaders and teachers could be a strong inhibitor of effective technology integration throughout the schools.

O'Dwyer et al. (2004) determined that one of the strongest predictors of school-to-school differences among teachers' use of technology for delivering instruction was perceived pressure to use technology. Teachers' perceived pressure by school leadership to use technology was positively associated with technology use and integration. Other findings related to the leader's role in technology integration were that principals must hold high expectations encourage and evaluate teacher's technology use, and both have and use a plan (Bridges, 2003; Bernal, 2001).

It is noteworthy that one teacher felt the high level of pressure from her leadership had only served to make her beliefs about technology integration more negative instead of positive. Since an individual's beliefs can strongly affect their behavior (Pajares, 1992), this example may emphasize the need for positive and supportive incentives for integration of technology, as well as perceived pressure in the form of realistic expectations. Leaders must also provide continued positive assurance to teachers that their effort to use technology to improve classroom instruction is worthwhile (Dwyer et al., 1991), a condition that this teacher did not believe was present, at least for her. This assurance and support may be achieved by recognizing effort, rewarding success, and fostering a sense of pride in these actions (Lan, 2001) and offering teachers much needed emotional and moral support (Sandholtz et al., 1997).

Additional Findings

The three schools involved in the qualitative phase of this study were identified as the extreme case schools by the survey analysis of the differences in the leader's and teacher's beliefs. The schools were demographically different from each other with one being majority Hispanic, one majority Black and one majority White. They also

represented both the highest level and lowest levels of student population socioeconomic status in the system. However, all three schools were extremely focused on student achievement as related to performance on the state proficiency tests required for meeting adequate yearly progress for the *No Child Left Behind Act of 2001* requirements. The elementary and middle schools were focused on remediation of below-grade level students and also on maintaining their passing scores on the Georgia Criterion Reference Competency Test (CRCT). The high school was focused on maintaining its status of having the highest scores in the system on the Georgia High School Graduation Test (GHSGT). As indicated in the additional data used in the study (LoTI and SACS reports) and by the comments of the leaders and teachers during the interviews, the majority of the technology integration in all three schools supported existing teaching practices, and the educators had developed skills related to the use of technology but had applied these skills to automate, accelerate, and enhance the teaching and learning strategies already in place. This finding supports O'Dwyer et al. (2004) who determined that the socioeconomic status of the school was a weak predictor of the differences in use of instructional technology among schools. It also supports Windschitl & Sahl's (2002) findings that technology is not the catalyst for teachers' changes, and that even with high access to technology, the instructional decisions made are significantly mediated by the teachers' and leaders' belief systems about what good teaching encompasses within the institutional culture, about the learners in a particular school, and about the role of technology in the lives of students.

School leaders and teachers often believe that in order to maintain and/or improve test scores on standardized measures, they must use traditional teacher-centered

instructional practices instead of more constructivist methods. It is possible that such beliefs about instructional practices influenced these schools' choices to use their technology mainly to support existing teaching and learning strategies and practices. This practice is supported by Ertmer (2005) who found that although teachers may state they believe that technology should be used for high-level problem solving activities, their daily use of technology may actually include a large number of drill-and-practice applications because their more central belief is that they are responsible for assuring that their students learn prerequisite or foundational skills, such as those related to successful performance on standardized tests. In addition, Zhao, Pugh, Sheldon, & Byers (2002) suggest that an innovation such as technology is less likely to be adopted fully if it deviates too greatly from the current values, pedagogical beliefs, and practices of the teachers and administrators in the school, even if information about the new methods and tools was provided through effective professional development. This would be especially true if the desired results of the current beliefs and practices are meeting the expectations and goals of the school, such as standardized test performance.

Implications

The investigation and explorations of the beliefs of school leaders and the teachers concerning support factors that affect technology integration is important because individual's beliefs strongly affect their behaviors (Pajares, 1992), beliefs are a powerful influence in the classroom, and an educator's personal and educational beliefs affect their choice of whether or not to use technology in the classroom (Honey & Moeller, 1990). Recognizing there was a difference in school leaders' and teachers' beliefs about technology integration was an important first step, but it was through the

gaining of the perspectives of the interview participants that important information was gained to further understand what those differences were and the implications those differences might have for classroom integration practices. This particular research has implications for school system and school-based leaders, for professional development leaders, and for teacher educators. These implications are followed by suggestions for future research.

Implications for School System and School-Based Leaders

Prior research has indicated that beliefs could have an impact on behaviors related to the successful integration of technology into classroom instruction (Ertmer, 1999; Ertmer et al., 1999; Pajares, 1992). Although both leaders and teachers believed the various components of support were available at their schools, there were significant differences in how they perceived that support and believed it was being enacted. Two categories of leadership support in which there were differences in the beliefs were the establishment of a school vision and/or culture for integration and the provision of pressure and incentives for integration. In this school system, there was a formal technology plan document with a written vision statement for technology use and integration in place. However, this plan or vision statement was never mentioned nor referenced by any of the school-based leaders or the teachers. This seems to indicate that the system leaders need to be much more effective with communicating this system plan and vision to all of the stakeholders at the school level if there is to be a system-wide commitment to achieving the goals and outcomes identified in that vision. In addition to the clear communication of the system plan and vision of technology integration, the school leadership needs to have a clear vision at their school level that supports the

system vision and also communicates clear purpose for technology integration and the goals for growth and improvement. This school vision for technology integration should be locally defined in a manner understood by all stakeholders so integration can be planned for, implemented, assessed, and generally understood, not simply a “feeling” (Pierson, 2001).

The establishment of a clearly defined and communicated vision is an important component of establishing a school culture for technology integration of which school leadership is a major component (Windschitl & Sahl, 2002). Since school culture was found to be the key to integrating technology into instruction, this should be a focus of school-based leadership. Elements of this school culture should include recognizing effort, rewarding success, and fostering a sense of pride in innovative technology-based instructional actions (Lan, 2001) as well as providing pressure to integrated technology in instruction as needed (O'Dwyer et al., 2004). Another necessary aspect of this culture should also be the provision of planning time designated specifically for technology practice, planning and collaboration (Dwyer, 1995; Ertmer, 1991; Garthwait and Weller, 2005; MacNeil and Delafield, 1998). A school culture containing these elements will be perceived by teachers as nurturing technology use and innovation will encourage the use and integration of technology.

Implications for Professional Developers

Gaining teachers’ perspectives of and their beliefs about the professional development they are provided is invaluable in planning how to provide learning that will improve their ability to provide effective, motivating and appropriate instruction with technology while meeting the achievement requirements of their students. Although the

purpose of this study was not to examine professional development beliefs of teachers, it became evident through the interviews that the professional development that had been provided for technology integration at the school was not believed to be as effective and useful for the teachers as the school leaders believed it to be. It seemed that the teachers felt their true needs for learning related to technology integration had not been met, especially concerning the use of technology for instructional rather than administrative purposes. Some of the teachers also believed there was a need for the leadership to be more proactive in making sure teachers who were low or resistant integrators of technology participated in effective technology integration professional development, and then follow-up to ensure that those teachers implemented the learned strategies. Since poor professional development may do more to impede technology integration than none at all (O'Dwyer et al., 2004), it is recommended that professional development designers and leaders carefully plan and select opportunities for learning that are grounded in the needs of the participants. One effective way to manage this would be to actually ask the teachers what it is they already know and what it is they need and want to learn, and then design the instruction to address those needs. In addition, the school leaders need to initiate and support appropriate technology professional development processes that reflect attention to adult learning principles (Coughlin, 1999).

Implications for teacher educators

Results of this study indicated that much of the use of technology in these schools was centered on supporting existing teacher-centered instructional practices and lower-level cognitive processing skills of the students. Such practice indicates that although teachers may state they believe that technology should be used for high-level problem

solving activities, their daily use of technology may actually be much different (Ertmer, 2005.) This may possibly occur because they have not had proper instruction themselves on how to implement more problem and project-based learning or student-centered activities in their classrooms, and then be able to use technology to effectively support such practices and strategies. Teacher educators may need to consider including instruction and practice in designing and implementing these type strategies for both pre-service teachers and existing teachers so they can enter or return to their own classes and use these strategies with their own students. In addition, teacher educators should also consider having the teachers in their courses use or increase the use of reflections in order to help make individuals' beliefs explicit to themselves so that they become more aware of what their actual beliefs are and how those beliefs can affect their own instructional practices. This is important because as Parajes (1992) found, even though knowledge and beliefs are inextricably intertwined, beliefs are the filter through which new phenomena and knowledge are interpreted, and also, individuals' beliefs strongly affect their behaviors.

Suggestions for Future Research

The findings reported in this paper are limited to participants in one school system outside a southeastern United States metropolitan city and the findings are not intended to be generalized to other populations. While these leaders' and teachers' perspectives are important, it would be worthwhile to have additional data to support the findings of this research. The participants for the interviews were selected from three different levels of schools – elementary, middle and high. Future research could implement a similar study but focus on multiple schools at one level and compare the results of the analysis across

those schools. A similar study could also be conducted in a similar sized school system in another region of the southeast or the United States to investigate the beliefs of those leaders and teachers concerning technology integration and compare the findings to those found in this study.

At the time of this study, research about a relationship between the instructional technology beliefs of school leadership and those same beliefs of their teachers was sparse at best. This research study sought to add to the body of literature in the area of educators' beliefs. This study found differences in the beliefs of school leaders and teachers concerning support factors related to technology integration and explored the nature and essence of those differences. Additional research could also investigate if a difference of beliefs between teachers and leaders about the existence and nature of beliefs related to support for technology integration has an impact on behaviors related to the successful integration of technology into classroom instruction. Another area of potential research could determine if these differences in beliefs between the school leaders and teachers concerning support factors related to technology integration prohibits the leadership from merging of the existing varied belief system of the teachers into a common culture that establishes and maintains successful integration of technology into classroom instruction. It would also be worthy to investigate how those beliefs can change and how one might influence that change to improve the practice of technology integration at all school levels.

One additional suggestion for future research is based on the additional findings from the study reported in this chapter that were not related directly to the research questions. It could be important to investigate the impact that the extreme focus on

student achievement, especially as related to performance on the standardized tests required for meeting adequate yearly progress for the *No Child Left Behind Act of 2001* requirements, has had on the technology use and classroom integration beliefs and practices of both teachers and their leaders. If it is believed that technology-integrating teaching practices that improve test scores are in direct conflict with constructivist-based technology integrating teaching practices, further explanations for why more teachers aren't using technology in more constructivist method could be exposed.

As emphasized by Ertmer (2005), these suggested areas for future research offer future opportunities to examine teacher beliefs and also the relationship of their pedagogical beliefs and technology integration so that a better understanding can be gained for why more teachers aren't using technology in the manners advocated in the literature. This understanding may then enable researchers and practitioners to create a more effective alignment between research, practice and beliefs in order to provide more effective ways to support and document teacher change.

Limitations

The data was gathered from school leaders and teachers from one public school system in Georgia. The findings and conclusions were based on the perspectives of these participants, and this specific and relatively small sample impedes generalization of the findings. Since participation was voluntary, it is possible that the beliefs and views of certain individuals were omitted from the study. These limitations should be considered when conducting future research in the area of beliefs. The research model used in this study combined both quantitative and qualitative methods and allowed for the leaders and teachers to make both anonymous responses to a survey and then selected participants to

express their beliefs in an interview with the researcher. Since the researcher was also an employee of the school system, this may have had an influence on some of the responses given in either the survey or the interviews. Additional research conducted by an outside researcher may discover different results even within the same population. In addition, the interviews were conducted with nine participants. A larger population of interview participants may add new details to the perspectives of this particular group. The schools for the interviews were selected as extreme cases by survey results that indicated the most significant differences between the beliefs of the leaders and teachers. If the extreme cases were identified by some other criteria, such as those schools whose leaders and teachers had the most similar beliefs on the survey, the findings about the aspects of those beliefs could be different from these findings or perhaps even similar once the surface level was penetrated. Either way, this would be interesting and informative to explore.

Major Contribution of this Study

The study of beliefs is important to education. Pajares (1992) stated that "Attention to beliefs of current and preservice teachers can inform educational practice in ways that prevailing research agendas have not and cannot" (p. 329). A contribution to the current body of research literature made by this study is that recognizing and understanding the differences in technology integration beliefs of school leaders and teachers can be significant for integration practices to be successful. At the surface level, it may appear that the school leaders and teachers possess the same beliefs concerning an instructional practice, such as technology integration. However, once the surface level is penetrated, existing differences in the beliefs between the leaders and teachers that influence instructional practice can come to light. Therefore, in order for implementation

of technology integration to be successful, one additional attribute that needs to be considered is the differences of the beliefs about technology integration between the leaders and teachers at the school. These beliefs need to be investigated, and if differences are found, those differences will need to be addressed in order for change in instructional practices to occur.

In addition, this study is important because it contributes to the body of knowledge in the area of mixed-methods research studies. The mixed methods design is relatively new in the world of research and offers great potential for promoting shared responsibility in the quest for achieving accountability for educational quality and more insight and understanding of underlying phenomenon (Johnson & Onwuegbuzie, 2004).

Concluding Thoughts

This study was based on the premise that the role of school leaders is crucial to successful classroom technology integration and was rooted in the theoretical assumptions espoused by Pajares (1992) concerning the effects of beliefs on educational practices. The findings in these differences have implications for both school system and school-based leadership actions as well as for improvement of communication between leaders and teachers and professional development provided for leaders and teachers. Attention to beliefs of educators can inform educational practice in ways that other research agendas have not (Pajares, 1992). Continued research into the existence and nature of beliefs about instructional technology integration is critical because the educational and instructional behaviors of both the school leaders and the teachers are related to their beliefs and, in the end, the goal of educational research on beliefs is to learn how beliefs change and how one might influence that change (Rokeach, 1968). This

is a worthy goal if we are to constantly improve instructional practices and the education of our future generations.

REFERENCES

The A-Plus Education Reform Act of 2000. Georgia House Bill 1187 (2000).

Ambrose, R., Clement, L., Philipp, R., & Chauvot, J. (2004). Assessing prospective elementary school teachers' beleifs about mathematics and mathematics learning. *School Science and Mathematics, 104*(2), 56-69.

Bandura, A. (1997). *Self efficacy: The Exercise of Control.* New York*:* W.H. Freeman

Becker, H. (1994). How exemplary computer-using teachers differ from other teachers: implications. *Journal of Research on Computing in Education, 26*(3).

Bernal, N. (2001). *A comparative analysis of teachers' and principals' perceptions of the implementation of instructional technology proficiencies in a large, urban school district. Unpublished doctoral dissertation.* Unpublished dissertation, Georgia State University, Atlanta.

Bhattacherjee, A. & Premkuymar, G. (2004). Understanding changes in belief and attitude toward information technology usage: a theoretical model and longitudinal test. *MIS Quarterly, 28*(2), 229-246.

Bridges, J. (2003). *Principal Influence: Sustaining a vision for powerful new forms of learning using technology.* Unpublished dissertation, University of California, Los Angeles.

Coughlin, E. (1999). Professional Competencies for the Digital Age. *Leading and Learning with Technology*. 27(3) Retrieved August 24, 2006, from http://ISTE.org

Creswell, J. (1994). *Research Design: Qualitative and quantitative approaches*. Thousand Oaks, California: SAGE Publications.

Creswell, J. (2003). *Research Design: Qualitative, quantitative, and mixed method approaches.* (2nd ed.). Thousand Oaks, California: Sage publications.

Creswell, J. (2005). *Educational Research: Planning, conducting, and evaluating quantitative and qualitative research.* (2nd ed.) Upper Saddle River: Pearson Education, Inc.

Creswell, J. & Plano-Clark, V. (2007). *Designing and Conducting Mixed-Methods Research.* Thousand Oaks, California: SAGE Publications.

Cuban, L. (1993). *How teachers taught: Constancy and change in American classrooms: 1890-1990.* (2nd ed.). New York: Teachers College Press.

Cuban, L. (2001). *Overused and undersold: computers in the classroom. (pdf version)*. Retrieved March 5, 2005, from http://www.hup.harvard.edu/pdf/CUBOVE.pdf

Culp, K. , Honey, M., & Mandinach, E. (2003). *A Retrospective in Twenty Years of Educational Technology Policy*. Retrieved March 8, 2005, from http://www.nationaledtechplan.org/participate/20years.pdf

Dawson, C. & Rakes, G. (2003). The influence of principals' technology training on the integration of technology into schools. *Journal of Research on Technology in Education, 36*(1), 29-34.

Duhaney, D. & Zemel, P. (2000). Technology and the educational process: transforming classroom activities. *International Journal of Instructional Media, 27*(1), 67-72.

Dusick, D. (1999). *Effects of administrative support policies, cognitive processes, and motivational beliefs on faculty uses of computer technology: Testing a*

motivational model. Unpublished dissertation, University of Southern California, Los Angeles.

Dwyer, D. (1995). *Changing the conversation about teaching, learning and technology - A report on 10 years of ACOT research.* Cuoertino, CA.: Apple Computer Inc.

Dwyer, D., Ringstaff, C., & Sandholtz, J. (1991). Changes in teachers' beliefs and practices in technology-rich classrooms. *Educational Leadership*, 45-52.

Ely, D. (1990a). Conditions that facilitate the implementation of educational technology innovations. *Journal of Research on Computing in Education, 23*(2), 298-305.

Ely, D. (1990b). Portability: cross-cultural educational perspectives. *Journal of Research on Computing in Education, 23*(2), 272-283.

Ely, D. (1995). *Technology is the answer! But what was the question?* Paper presented at the The James P. Curtis Distinguished Lecture, Capstone College of Education Society, University of Alabama.

Ertmer, P. (1999). Addressing first- and second-order barriers to change: Strategies for technology integration. *Educational Technology, Research and Development, 47*(4), 47-62.

Ertmer, P. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development, 53*(4), 25-39.

Ertmer, P., Addison, P., Lane, M., Ross, E., & Woods, D. (1999). Examining teachers' beliefs about the role of technology in the elementary classroom. *Journal of Research on Computing in Education, 31*(1), 54-72.

Feldner, L. (2003). *The role of school administrators in supporting teachers in the integration of educational technology into K-12 classrooms.*, University of North Dakota, Grand Forks.

Ford, M. (1992). *Human motivation: Goals, emotions, and personal agency beliefs.* Newbury Park, CA: Sage Publications.

Fullan, M. (1982). *The meaning of educational change.* New York: Teachers College Press.

Fullan, M. (1991). *The new meaning of educational change*. New York: Teachers College Press.

Fuller, H. (2000). First teach their teachers: Technology support and computer use in academic subjects. *Journal of Research on Computing in Education, 32*(4), 511-537.

Fulton, K. & Torney-Purta, J. (1999). *How teachers' beliefs about teaching and learning are reflected in their use of technology: Case studies from urban schools.* Retrieved February 28, 2005, from http://www.l2l.org/iclt/2000/papers/126a.pdf

Garthwait, A. and Weller, H. (2005). Two seventh grade teachers implement one-to-one computing. Journal of Research on Technology in Education, 37(4), 361-377.

Glaser, B. & Strauss, A. (1999). *The discovery of grounded theory: Strategies for qualitative research*. Hawthorne, NY: Aldine De Gruyte.

Grabe, M. & Grabe, C. (2001). *Integrating Technology for Meaningful Learning* (3rd ed.). Boston: Houghton Mifflin Co.

Greene, J., Caracelli, V. & Graham, W. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis*, 11, 255-274.

Hamilton, R. (1998). *Performance discrepancies in the use of Instructional technology.* Unpublished dissertation, Georgia State University, Atlanta, GA.

Hebert, M. & Benbasat, I. (1994). Adopting information technology in hospitals: The relationship between attitudes/expectations and behavior. *Hospital and Health Administration, 39*(3), 369-383.

Hohensee, T. (1998). *Factors associated with computer use by middle school teachers.* Unpublished Dissertation, Georgia State University, Atlanta, GA.

Holloway, R. E. (1998). Diffusion and adoption of educational technology: A critique of research design. . In D. J. Jonassen (Ed.), *Handbook of Research on Educational Communications and Technology* (pp. 1107-1133). Mahwah, NJ: Lawrence Erlbaum, Inc.

Honey, M. & Moeller, B. (1990). *Teachers' beliefs and technology integration: different values, different understandings.* New York, NY: Center for Technology in Education.

ISTE/NETS National Education Technology Standards Project. (2003). Retrieved July 12, 2003, from http://cnets.iste.org/index.shtml

Johnson, R. & Onwuegbuzie, A. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher, 33 (7), pp.14-26.*

Kagan, D. (1992). Implications of research on teacher beliefs. *Educational Psychologist, 27*(1), 65-90.

Kerr, S. T. (1996). Visions of Sugarplums: The future of technology, education, and the schools. In S. T. Kerr (Ed.), *Technology and the future of schooling: Ninetyfifth yearbook of the National Society for the Study of Education (part 2)* (pp. 1-27). Chicago: University of Chicago Press.

Khalili, A. & Shashaani, L. (1994). The effectiveness of computer applications: A meta-analysis. *Journal of Research on Computing in Education, 27*(1), 48-61.

Kozma, R. (2003). *Technology, Innovationa and educational change: A global perspective*. Eugene, Oregon: Internation Society for Technology in Education.

Kvale, S. (1996). *InterViews: An introduction to qualitative research interviewing*. Thousand Oaks, CA: Sage Publications.

Lan, J. (2001). Web-based instruction for education faculty: A needs assessment. *Journal of Research on Computing in Education, 33*(4), 385-399.

Leatham, K. (2002). *Preservice secondary mathematics teachers' beliefs about teaching with technology.* Unpublished dissertation, University of Georgia, Athens, GA.

LeCompte, M. & Schensul, J. (1999). *Analyzing and Interpreting Ethnographic Data*. Walnut Creek, CA: Altamira Press.

Loague, A. (2003). *Beliefs and practices regarding technology: Influences on professional instructional technology practices.* Unpublished dissertation, University of Alabama, Tuscaloosa, AL.

Lumpe, A. & Chambers, E. (2001). Assessing teachers' context beliefs about technology use. *Journal of Research on Technology in Education, 34*(1), 93-109.

Lunenberg, F. (1998). Constructivism and technology: Instructional designs for successful education reforms. *Journal of Instructional Psychology, 35*(2), 75-81.

MacNeil, A., & Delafield, D. (1998). Principal leadership for successful school technology implementations. Paper presented at the 9th International Conference of Society for Information Technology and Teacher Education, March 10-14, 1998, Washington, DC, USA.

McKenzie, J. (1991). *Designing staff development for the information age.*, Retrieved June 15, 2003, from http://www.fno.org/fnoapr91.html

Mecklenburger, J. (1989). Technology in the 1990s:Ten Secrets for Success." *Principal, 2,* 6-8.

Merriam, S. (1998). *Qualitative research and case study application in education* (2nd ed.). San Francisco, CA: Jossey-Bass.

Miller, L. & Olson, J. (1994). Putting the computer in its place: A study of teaching with technology. *Journal of Curriculum Studies, 26*, 121-141.

Moersch, C. (2001). Using LoTI as a research tool. *Leading and Learning with Technology*, 29(3), pp.22-27.

Morrison, G., Lowther, D., & DeMeulle, L. (1999). *Integrating computer technology into the classroom*. Upper Saddle River, NJ: Merrill/Prentice Hall.

Morton, S. (1999). *Teacher and technology: Meeting changing needs.* Unpublished Doctoral dissertation, Fordham University.

National School Boards Association. (2002). Tech standards for adminsitrators released. Available online at http://www.electronic-school.com/2002/01/0102ewire.html

National Education Technology Plan. (2005). Retrieved April 5, 2005, from http://www.nationaledtechplan.org/default.asp

No Child Left Behind Act of 2001, Pub. L. No. 107-110 , 115 Stat. 1425 (2002).

Office of Technology Assistance. (1995). Teachers and Technology: Making the Connection. Retrieved July 20, 2004, from http://www.coedu.usf.edu/itphdsem/eme7938/ota9541.pdf

O'Dwyer, L., Russell, M., and Bebell, D. (2004). *Elementary teachers use of technology: Characteristics of teachers, schools and districts associated with technology use.* Boston, MA: Technology and Assessment Study Collaborative, Boston College. Retrieved July 25, 2005 from http://www.bc.edu/research/intasc/studies/USEIT/pdf/USEIT_r13.pdf

Olsen, M. (1991). *Societal Dynamics*. Englewood Cliffs, NJ: Prentice Hall.

Pajares, F. (1992). Teacher's beliefs and educational research: Cleaning up a messy construct. Review of Educational Research, 62, 307-332.

Patton, M. (2002). *Qualitative research and evaluation methods.* (3rd ed.). Thousand Oaks, CA: Sage Publications.

Peck, C., Cuban ,L., and Kirkpatrick, H. (2002). Techno-promoter dreams, student realities. *Phi Delta Kappan, 83*(6), 472-480.

Petraglia, I. (1998). *Reality by design: The rhetoric and technology of authenticity in education.* Mahwah, NJ: Lawrence Erlbaum Associates.

Pierson, M. (2001). Technology integration practice as a function of pedagogical expertise. *Journal of Research on Computing in Education, 33*(4), 413-430.

Pisapia, J. (1994). *Teaching with technology: roles and styles.* Paper presented at the Metropolitan Educational Research Consortium, Richmond, VA.

Plomp, W. & Pelgram,. T. (1991). *The use of computers in education worldwide: Results from the IEA Computers in Education' survey in 19 educational systems.* Oxford: Pergamon Press.

Porras, J. and R. Silver (Ed.). (1991). *Organization development and transformation.*

Rokeach, M. (1968). *Beliefs, attitudes, and values: A theory of organization and change*. San Francisco: Jossey-Bass.

Russell, M. (2004). *What Leaders Can Do to Affect Classroom Technology Use.* Paper presented at the National Education Computing Consortium, New Orleans, LA.

Saloman, G. (2002, March-April). *Technology and Pedagogy: Why don't we see the promised revolution?* Retrieved March 5, 2005, from http://www.wiu.edu/TLTC/resources/Bennett/Technology_and_Pedagogy.pdf

Sandholtz, J., Ringstaff, C., & Dwyer, D. (1994). *Student engagement revisited: Views from technology-rich classrooms*: Apple Classrooms of Tomorrow report #21.

Sandholtz, J. H., Ringstaff, C. , Dwyer, D.C. (1997). *Teaching with technology: Creating student centered classrooms*. New York: Teachers College Press.

Scheffler, F. & Logan, J. (1999). Computer technology in schools: what teachers should know and be able to do. *Journal of Research in Education, 31*(3), 305-327.

Schensul, S., Schensul, J., & LeCompte, M. (1999). *Essential Ethnographic Methods: Observations, Interviews and Questionaires* Walnut Creek, California: Altamira Press.

Schuttloffel, M. (1995). *A handbook for technology implementation.*, 2003, from http://www.cssjournal.com/archives/shuttlo.html

Slowinski, J. (2000). *Becoming a technologically savvy administrator*. Retrieved June 30, 2004, from http://eric.uoregon.edu/publications/digests/digest135.html

Tashakkoir, A. & Teddlie, C. (1998). *Mixed Methodology: Combining qualitative and quantitative approaches.* Thousand Oaks, California: Sage Publications.

Vockell, E. & Sweeney, J. (1994). How do teachers who use computers competently differ from other teachers? *Journal of Computing in Teacher Education, 10*(2), 24-31.

Wang, Y. (2002). When technology meets beliefs: Pre-service teachers' perception of the teachers' role in the classroom with computers. *Journal of Research on Technology in Education, 35*(1), 150-162.

Wenglinsky, H. (1998). *Does it Compute?The Relationship Between Educational Technology and Student Achievement in Mathematics*, from http://www.ets.org/research/pic/technolog.html

Williams, K. (2001). *Teacher's perceptions of factors that effect their technology integration.* . Unpublished Education Specialist paper, Georgia State University, Atlanta, GA.

Windschitl, M. & Sahl, K. (2002). Tracing teachers' use of technology in a laptop computer school: The interplay of teacher beliefs, social dynamics, and institutional culture. . *American Educational Research Journal, 39*(1), 165-205.

Yin, R. (2003). *Case Study Research: Design and methods.* (3rd ed.). Thousand Oaks, California: Sage Publications.

APPENDIXES

APPENDIX A

Beliefs About Teaching with Technology (BATT) survey

This survey consists of two sets of 14 questions about school environmental support factors that may have an impact on using technology effectively in the classroom. Please respond honestly and directly to each item. Responses to the survey are anonymous. Results will be used to guide system efforts to improve support to schools for technology integration efforts.

Completion of this survey indicates consent for the researcher to use the data provided for her study. If at any time you decide you no longer wish to participate, simply close the browser and none of your responses will be recorded. Thank you for your time.

How many years experience do you have in education?

0-2
3-10
10-20
20-30+

How many years have you been at your current school?

0-2
3-10
10-20
20-30+

If you have less than 3 years at your current school, where were you prior to this school? (Choose the best description.)

I've been in this system 3 or more years
I worked in another Georgia school system
I worked in a school system outside of Georgia.
I was a full time student.
I was not employed in a school system.

At which school are you employed/located? Select one.

BES
CJH
FSE
HCE
HTE
JHH
LES
PCE
PSE
SES
SCE
Program Challenge Center
Alpha School
CMS
EMS
MMS
HHS
RCHS
SHS
central office

Which position do you currently hold?

School leadership: Principal, Assistant Principal, Assistant Principal for Instruction, or Instructional Lead Teacher
Classroom teacher, one or more core subject areas
Gifted education teacher (no regular ed classes)
Special education/ESOL teacher
Physical education/health teacher
Counselor
Connections teacher (MS)
Art, music, foreign language teacher
ITS
Career/tech teacher
Other academic area

Which grade level do you teach?

PK/K
1
2
3
4
5
6
7
8
9
10
11
12
multiple grades - elementary school
multiple grades - middle School
multiple grades - high school

If you are a classroom teacher, in which academic area do you teach? Choose your primary area.

language arts
social studies
math
science
fine arts
all areas (elementary)
other area not listed above
not a classroom teacher

Have you COMPLETED the Technology proficiency requirement for Georgia/Rockdale County?

Yes, through RockIT.
Yes, through InTech.
Yes, through college coursework.
Yes, through the portfoilio.
Yes, through professional development in another system.
Yes, though another method not listed above.
No, I have not yet completed this but I will by June 30.
No, and I will not complete by June 30.

Suppose your goal is to effectively use technology in your classroom. Listed below are a number of school environmental support factors that may have an impact on this goal. Please indicate the degree to which you believe each factor will enable you to effectively use technology.

Resources (funding, equipment, etc.)

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Professional development opportunities on using technology

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Access to the Internet

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Quality software

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Physical classroom structures (electrical outlets, movable tables, circuit breakers, space, etc.)

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Support from school administrators

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Support from parents

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Support from other teachers

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Technical support (technician)

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Time to plan for technology implementation

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Time to let students use technology
strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Smaller class sizes

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Mobile equipment (laptops, etc.)

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Proper connections (computer to projector, etc.)

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Please indicate what you believe the likelihood that these factors will occur at your school or school system (be available to you)in order to enable you to effectively use technology.

Resources (funding, equipment, etc.)

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Professional development opportunities on using technology

strongly disagree
disagree
neither agree or disagree
agree
strongly agree
Access to the Internet

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Quality software

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Physical classroom structures (electrical outlets, movable tables, circuit breakers, space, etc.)
strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Support from school administrators

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Support from parents

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Support from other teachers
strongly disagree
disagree
neither agree or disagree
agree
strongly agree
Technical support (technician)

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Time to plan for technology implementation

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Time to let students use technology

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Smaller class sizes

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Mobile equipment (laptops, etc.)

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

Proper connections (computer to projector, etc.)

strongly disagree
disagree
neither agree or disagree
agree
strongly agree

If you are willing to volunteer to participate in a private interview with the researcher concerning technology integration issues, please give your name and school here. Volunteering to be interviewed will not create a link between your personal identification to the online survey. Your responses will still be unidentifiable. All responses will be kept confidential.

Thank you for your time!

APPENDIX B

Informed Consent Letter

Katherine Williams
Instructional Technology Coordinator
[redacted] Public Schools
[redacted] Street
[redacted]

March __, 2006

Greetings:

This letter is to request your participation in a survey of school leadership and teacher beliefs about technology use. You are being asked to participate as an employee of [redacted]. The purpose of this survey research is to examine the beliefs about instructional technology use in the classroom by individuals employed in this school system.

The study consists of a survey which may be completed online. Paper copies of the surveys are available upon request from the researcher, Ms. Williams, via email at kwilliams@rockdale.k12.ga.us or phone call at 770.860.4237. The survey should take a maximum of 15-20 minutes to complete. There are no identified risks of participation. The results of the survey will be used as part of the researcher's dissertation project for the Instructional Technology Program in the Middle School and Instructional Technology Department at Georgia State University. It is hoped that the results of this study can be used to improve future instructional technology staff development in the system. The survey is available online at http://www.quia.com/sv/77035.html.

Participation in research is voluntary. You will not be identified personally. You have the right to refuse to be in this study. At no time with your employment with [redacted] be at any risk due to your participation or refusal to participate. You may skip questions or discontinue participation at any time. If you decide to participate in the study and change your mind, you have the right to drop out at any time. In order to drop out, simply close the online survey browser window and there will be no record of any questions being answered by you.

All records are private to the extent allowed by law. No individual identification information is requested or recorded. You will not be identified personally in any manner. All findings will be summarized and reported in group form.

If you have questions about this study, contact my advisor, Dr. Laurie Dias, at 404-651-0208 or mstlbd@langate.gsu.edu. If you have questions or concerns about your rights as a participant in this research study, you may contact the Institutional Review Board (IRB) which oversees the protection of human research participants. Susan Vogtner, the IRB Compliance Specialist, can be reached at 404-463-0674 or svogtner1@gsu.edu.

Completion of this survey indicates consent for the researcher to use the data provided for her study.

APPENDIX C

Research Permission Letter

February 20, 2006

Ms. Katherine Williams
Instructional Technology Coordinator
[redacted] Public Schools
[redacted]

Dear Ms. Williams:

Your request to engage in a research project to investigate the beliefs of school leaders and teachers concerning support factors that affect technology integration in the [redacted] school system is approved subject to the following condition to which you stated you would adhere:

> No individual teacher or administrator names or other personally identifiable information will be released or published in any manner.

Also, you indicate staff members will be involved in interviews. Because of the importance of time on task in providing instruction, please keep the length of the interviews with teachers to a minimum so that it does not disrupt the instructional program. You also may use any data that you collect as part of your position and similar appropriate documents as needed to validate your results.

Best of luck with the research and the coursework in which you are engaged.

Sincerely,

[redacted]

[redacted]
Assistant Superintendent for Instruction

/lb

cc: [redacted] Technology Director

APPENDIX D

Hypothesis Enable/ Likelihood	**Statement from survey**	**Category of administrative support**
3/7	Resources (funding, equipment, etc.)	Access to appropriate resources.
2/6	Professional development opportunities on using technology	Professional development opportunities
3/7	Access to the Internet	Access to appropriate resources.
3/7	Quality software	Access to appropriate resources.
3/7	Physical classroom structures (electrical outlets, tables, circuit breakers, space, etc.)	Access to appropriate resources.
1/5	Support from School administrators	General administrative support for teachers.
4/8	Support from parents	School vision and/or culture for integration

Hypothesis Enable/ Likelihood	Statement from survey	Category of administrative support
4/8	Support from other teachers	School vision and/or culture for integration.
1/5	Technical support (technician)	General administrative support for teachers.
1/5	Time to plan for technology implementation	General administrative support for teachers
4/8	Time to let students use technology	School vision and/or culture for integration.
4/8	Smaller class sizes	School vision and/or culture for integration.
3/7	Mobile equipment (laptops, etc.)	Access to appropriate resources.
3/7	Proper connections (computer to projector, etc.	Access to appropriate resources.

APPENDIX E

Interview Questions – leadership

1. Tell me about your school's vision of technology integration.

2. What do you consider to be your personal beliefs of the importance of technology integration?

3. Describe your perceptions of the practice of technology integration in your school.

4. What do you see as the most effective uses of technology in a classroom?

5. What effect do you see technology having on student achievement?

6. What effect do you see technology having on student motivation?

7. What can you tell me about the role you play as a school leader in technology integration?

8. Tell me about specific ways your school leadership views and practices have affected your teachers' vision of technology. Tell me about specific ways your school leadership has affected your daily use of technology.

9. Do you make it a specific practice to require lessons that utilize technology integration and standards?

10. Do you make it a specific practice to observe technology- integrating lessons?

11. How do you evaluate teachers on their technology use?

12. How would you describe the condition of access to technology resources at your school?

13. What supports from school leaders do teachers need in order to integrate technology effectively in the classroom?

14. Tell me about specific actions you think school leaders such as yourself should take in considering the use of technology by teachers?

15. What types of professional development for improving technology integration are

provided at your school? Is this optional or required? Do you participate? Why or why not? Is there technology training not provided that you would like to see offered? Please describe.

Interview Questions – Teacher

1. Tell me about your school's vision of technology integration.

2. What do you consider to be your personal beliefs of the importance of technology integration?

3. Describe your practice of technology integration in your classroom.

4. What do you see as your most effective use of technology in your classroom?

5. What effect do you see technology having on student achievement?

6. What effect do you see technology having on student motivation?

7. What can you tell me about the role your school leadership plays in your technology integration?

8. Tell me about specific ways your school leadership has affected your vision of technology use in the classroom. Tell me about specific ways your school leadership has affected your daily use of technology.

9. Do you make it a specific practice to create/and or use lessons that utilize technology integration and standards?

10. Does the leadership make a point to observe technology-integrating lessons?

11. How does your school leadership evaluate teachers on their technology use?

12. How would you describe the condition of access to technology resources at your school?

13. What supports do teachers need from school leaders in order to integrate technology effectively in the classroom?

14. Tell me about specific actions your school leadership should take in considering the use of technology by teachers?

15. What types of professional development for improving technology integration are provided at your school? Isthis optional or required? Do you participate? Why or why not? Is there technology training not provided that you would like to see offered? Please describe.

APPENDIX F

Research Questions and Context to Data Sources

6. Is there a difference between the school leadership and the teachers in their beliefs about the types and availability of support factors that affect technology integration?
7. What are school leaders' beliefs about the support role they play in teacher integration of instructional technology?
8. What are teachers' beliefs about the support role that school leadership plays in teacher integration of instructional technology?
9. How do school leaders describe the support they provide for teacher integration of technology in the classroom?
10. How do teachers describe the support they receive from school leaders for their integration of technology in the classroom?

Data Source	Research question 1	Research question 2	Research question 3	Research question 4	Research question 5	Context of study
Survey	X					
Interviews	X	X	X	X	X	
LoTI					X	X
SACS report				X	X	X

APPENDIX G

Samples from Journal

Interview MS LA teacher –

Very dedicated teacher, gifted ed, very student centered, long term at this school (at least for this school which has a high turnover rate). Throughout the interview I felt a slight undercurrent of frustration with technology being "shoved down the throat" and a lack of access for her because she is off-team in a team environment. She teaches gifted but has less access than do the other "regular" ed teachers. Seems odd but is the reality at other schools also. She might use technology more if she had more access. I feel like she doesn't like the way technology is supposed to be used here either – doesn't seem to blend with her preferred strategies with high-level learners. This could be a conflict in her teaching belief system and technology expectations here.

Interview High school math teacher –

Very friendly, easy to talk to – seems very honest. Sees need to use technology with today's students, but I can sense some frustration with her not having the access she feels she needs in room or labs. I think if she had access she would take it and run. Wants to work with higher level problem solving and use tech to support that – mentioned needs of advanced students.

Observation of all teacher interviews –

Wary of saying anything negative about the leadership – don't want to "get anyone into trouble."

Most of the teachers seemed to be a little hesitant at first when talking, as if they were a little wary about "tattling" on the school.

It seems that the majority of the teachers I've interviewed are the "bigger" users – since they were the volunteers, it could be one way the data is skewed – they wanted to talk where those who don't use much tech would possibly do the survey since it was anonymous but not volunteer to actually talk to me.

I could tell all the teachers wanted to say the "right" thing, as did the principals. Perhaps seeking my "approval" – another way responses may be self-controlled by them. This hesitance and approval seeking seems to lessen as the interviews progress, especially with the teachers.

Leadership

Elementary principal covers a lot of what the big projects done by a few are, but I'm not so sure that everyone is really involved to the great extent she seems to expouse…critical thinking is important but are all teachers using it that way, and how do you know if you only informally observe and keep no records in plans or formal form?

Seems to be a lot of dependency on the school ITS – what if this person has limited strengths – strengths are more hardware-based or web development and not instructional assistance/guidance strengths – what does that imply for teaching staff use?

Middle school principal – talked a lot, almost in a bragging or trying to impress me manner, especially about the 'stuff' they have. Most importance seemed to be put on the remediation effort of the school, a previous "needs improvement" school

All three principals know the "buzzwords" they are supposed to say.

General observations

Most all mentioned tech knowledge as important to the students because of the "real" world or for future "careers/work/jobs" – is school not real?

June 19, 2006
So far everyone says there is a vision but there doesn't seem to be an exact one in writing that everyone knows – they just "feel" that technology is important but not exactly why…

June 21, 2006

Modeling by other teachers is mentioned several times– could this be more organized? Seems to just kind of happen…

APPENDIX H

LoTI REPORTS

Data Summary				
Organization	**Number of Surveys**	**LoTi**	**PCU**	**CIP**
Eastern Public Schools	**608**	**Level 3**	**Level 5**	**Level 4**
	0	**-**	**-**	**-**
	36	**Level 3**	**Level 6**	**Level 4**
	0	**-**	**-**	**-**
Central Middle School	**0**	**-**	**-**	**-**
	47	**Level 3**	**Level 5**	**Level 4**
	22	**Level 3**	**Level 5**	**Level 4**
West High School	**74**	**Level 3**	**Level 5**	**Level 4**
	11	**Level 2**	**Level 5**	**Level 4**
	33	**Level 3**	**Level 5**	**Level 4**
	24	**Level 2**	**Level 5**	**Level 4**
North Elementary School	**24**	**Level 2**	**Level 6**	**Level 3**
	28	**Level 3**	**Level 5**	**Level 4**
	69	**Level 3**	**Level 6**	**Level 4**
	17	**Level 4a**	**Level 5**	**Level 5**
	35	**Level 3**	**Level 5**	**Level 4**
	0	**-**	**-**	**-**
	92	**Level 3**	**Level 6**	**Level 4**
	70	**Level 3**	**Level 5**	**Level 4**
	0	**-**	**-**	**-**
	25	**Level 4a**	**Level 6**	**Level 5**

Level 0: Nonuse
Are cobwebs forming around your classroo 303 ters?
Description:
A perceived lack of access to technology-based tools (e.g., computers) or a lack of time to pursue electronic technology implementation. Existing technology is predominately text-based (e.g., ditto sheets, chalkboard, overhead projector).
Classroom Observations:

- No visible evidence of computer access in the classroom
- Classroom computers sit idle during the instructional day

Level 1: Awareness
Who's using the computers? The teacher or the students?
Description:
The use of technology-based tools is either (1) one step removed from the classroom teacher (e.g., integrated learning system labs, special computer-based pull-out programs, computer literacy classes, central word processing labs), (2) used almost exclusively by the classroom teacher for classroom and/or curriculum management tasks (e.g., taking attendance, using grade book programs, accessing email, retrieving lesson plans from a curriculum management system or the internet) and/or (3) used to embellish or enhance teacher-directed lessons or lectures (e.g., multimedia presentations).

Level 2: Exploration
Is the focus more on computer use or on the critical content?
Description:
Technology-based tools supplement the existing instructional program (e.g., tutorials, educational games, basic skill applications) or complement selected multimedia and/or web-based projects (e.g., internet-based research papers, informational multimedia presentations) at the knowledge/comprehension level. The electronic technology is employed either as extension activities, enrichment exercises, or technology-based tools and generally reinforces lower cognitive skill development relating to the content under investigation.

Level 3: Infusion
Is higher order thinking and problem solving linked to critical content the focus of computer use in the classroom?
Description:
Technology-based tools including databases, spreadsheet and graphing packages, multimedia and desktop publishing applications, and internet use complement selected instructional events (e.g., field investigation using spreadsheets/graphs to analyze results from local water quality samples) or multimedia/web-based projects at the analysis, synthesis, and evaluation levels. Though the learning activity may or may not be perceived as authentic by the student, emphasis is, nonetheless, placed on higher levels of cognitive processing and in-depth treatment of the content using a variety of thinking skill strategies (e.g., problem-solving, decision-making, reflective thinking, experimentation, scientific inquiry).

Level 4a: Integration (Mechanical)
Do classroom management issues relating to authentic, problem-based learning impede your progress with this type of teaching and learning approach?
Description:
Technology-based tools are integrated in a mechanical manner that provides rich context for students' understanding of the pertinent concepts, themes, and processes. Heavy reliance is placed on prepackaged materials and/or outside resources (e.g., assistance from other colleagues), and/or interventions (e.g., professional development workshops) that aid the teacher in the daily management of their operational curriculum. Technology (e.g., multimedia, telecommunications, databases, spreadsheets, word processing) is perceived as a tool to identify and solve authentic problems as perceived by the students relating to an overall theme/concept. Emphasis is placed on student action and on issues resolution that require higher levels of student cognitive processing and in-depth examination of the content.

Level 4b: Integration (Routine)
Is designing and managing student-based learning experiences using the available computers the most rewarding part of your workday?
Description:
Technology-based tools are integrated in a routine manner that provides rich context for students' understanding of the pertinent concepts, themes, and processes. At this level, teachers can readily design and implement learning experiences (e.g., units of instruction) that empower students to identify and solve authentic problems relating to an overall theme/concept using the available technology (e.g., multimedia applications, internet, databases, spreadsheets, word processing) with little or no outside assistance. Emphasis is again placed on student action and on issues resolution that require higher levels of student cognitive processing and in-depth examination of the content.

Level 5: Expansion
Are you ready to advance into uncharted areas of powerful teaching strategies linked to advanced technology use?
Description:
Technology access is extended beyond the classroom. Classroom teachers actively elicit technology applications and networking from other schools, business enterprises, governmental agencies (e.g., contacting NASA to establish a link to an orbiting space shuttle via internet), research institutions, and universities to expand student experiences directed at problem-solving, issues resolution, and student activism surrounding a major theme/concept. The complexity and sophistication of the technology-based tools used in the learning environment are now commensurate with (1) the diversity, inventiveness, and spontaneity of the teacher's experiential-based approach to teaching and learning and (2) the students' level of complex thinking (e.g., analysis, synthesis, evaluation) and in-depth understanding of the content experienced in the classroom.

Level 6: Refinement

Have you reached the promise land involving the power and potential of instructional computing?

Description:

Technology is perceived as a process, product (e.g., invention, patent, new software design), and/or tool for students to find solutions related to an identified "real-world" problem or issue of significance to them. At this level, there is no longer a division between instruction and technology use in the classroom. Technology provides a seamless medium for information queries, problem-solving, and/or product development. Students have ready access to and a complete understanding of a vast array of technology-based tools to accomplish any particular task at school. The instructional curriculum is entirely learner-based. The content emerges based on the needs of the learner according to his/her interests, needs, and/or aspirations and is supported by unlimited access to the most current computer applications and infrastructure available.