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Elementary Teachers' Experiences with Technology Professional Development and Classroom Technology Integration: Influences of Elements of Diffusion and Support

Frances LeAnna Bryant

ACCEPTANCE

This dissertation, ELEMENTARY TEACHERS' EXPERIENCES WITH TECHNOLOGY PROFESSIONAL DEVELOPMENT AND CLASSROOM TECHNOLOGY INTEGRATION: INFLUENCES OF ELEMENTS OF DIFFUSION AND SUPPORT, by FRANCES LEANNA BRYANT, was prepared under the direction of the candidate's Dissertation Committee. It is accepted by the committee members in partial fulfillment of the requirements for the degree Doctor of Philosophy in the College of Education, Georgia State University.

The Dissertation Advisory Committee and the student's Department Chair, as representatives of the faculty, certify that this dissertation has met all standards of excellence and scholarship as determined by the faculty. The Dean of the College of Education concurs.

_____
Olga S. Jarrett, Ph.D.
Committee Chair

_____
Julie Rainer Dangel, Ph.D.
Committee Member

_____
Yali Zhao, Ph.D.
Committee Member

_____
Mary Shoffner, Ph.D.
Committee Member

_____
Date

_____
Barbara Meyers, Ed.D.
Chair, Department of Early Childhood Education

_____
R.W. Kamphaus, Ph.D.
Dean and Distinguished Research Professor
College of Education

AUTHOR'S STATEMENT

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Frances LeAnna Bryant

2909 Egret Lane

Austell, GA 30106

The director of this dissertation is:

Dr. Olga S. Jarrett

Department of Early Childhood Education

College of Education

Georgia State University

Atlanta, GA 30303-3083

VITA

Frances LeAnna Bryant

ADDRESS: 2909 Egret Lane
Austell, GA 30106

EDUCATION:

Ph.D.	2008	Georgia State University Early Childhood Education
M.S.	1998	Baylor University Curriculum and Instruction
B.S.	1996	Baylor University Early Childhood Education

PROFESSIONAL EXPEREINCE:

2005-present	Graduate Teaching Assistant Georgia State University, MSIT Department
2006-present	Milford Elementary School, Computer Lab Teacher Cobb County School District, Cobb County, GA
2001-2006	Mableton Elementary School, Classroom Teacher Cobb County School District, Cobb County, GA
1998-2001	Harmony Leland Elementary School, Classroom Teacher Cobb County School District, Cobb County, GA

PROFESSIONAL SOCIETIES AND ORGANIZATIONS:

2007-present	International Society for Technology in Education

PRESENTATIONS AND PUBLICATIONS:

Zhao, Y. and Bryant, F. (2006). Can teacher technology integration training alone lead to high levels of technology integration? A qualitative look at teachers' technology integration after state mandated technology training. *Electronic Journal for the Integration of Technology in Education*, 5, 62-63.

Zhao, Y. and Bryant, F. (October, 2006). Can teacher technology integration training alone lead to high levels of technology integration? A qualitative look at teachers' technology integration after state mandated technology training. Paper presented at the annual conference of Georgia Association of Teacher Educators, Atlanta, GA.

Bryant, F. (2005, November). Impact of Peer Coaching on Elementary Teachers' Technology Integration. Paper presented at the annual Georgia Educational Technology Consortium, Atlanta, GA.

Bryant, F. (2004, February). The Effect of Technology on Students' Perceptions of Instruction: Work or Play Part II. Paper presented at the annual conference of The Association for the Study of Play, Atlanta, GA.

Bryant, F. & Jarrett, O. (2003, February). The Effect of Technology on Students' Perceptions of Instruction: Work or Play. Paper presented at the annual conference of The Association for the Study of Play, Charleston, SC.

ABSTRACT

ELEMENTARY TEACHERS' EXPERIENCES WITH TECHNOLOGY PROFESSIONAL DEVELOPMENT AND CLASSROOM TECHNOLOGY INTEGRATION: INFLUENCES OF ELEMENTS OF DIFFUSION AND SUPPORT

by

Frances LeAnna Bryant

Lack of teacher technology integration is a documented concern within education. Effective staff development practices, the need for on-going support, and the presence of elements of diffusion are all recognized as factors that lead to higher rates of technology integration. These elements are not currently studied as a whole in research on technology education. This study sought to examine all three of these factors within a southern metropolitan school district's technology teacher development initiative. The following questions guided the research:

1. How do teachers experience the five elements of diffusion (complexity, triability, observability, relative advantage, and compatibility) in the area of technology integration in elementary schools?
2. How do teachers experience instructional technology support and the impact of support on their technology integration instruction?
3. How do teachers experience technology staff development and the impact of staff development on their classroom technology integration?

Data were collected from 81 online survey participants, 16 oral interview and web log analysis participants, and an interview with the project director at the completion of the first year of a two-year initiative. Participants received updated technology tools within their classroom and were required to take technology related courses, keep web logs, and

complete technology projects. Research was conducted within a mixed methods triangulation design using a pragmatic paradigm with descriptive statistics and correlations as forms of quantitative analysis and a phenomenological approach applied in qualitative analysis. Findings showed the presence of elements of diffusion and support across all data sources. Teachers' experiences with the program were positive and led to frequent and varied technology integration. Correlations indicated high levels of interrelatedness among the variables of support, elements of diffusion, and impact on instruction. Teachers reported enhanced engagement in learning among themselves and their students. The fact that teachers chose to be in the staff development program and had choices within the program to fulfill the requirements appeared to engage and motivate them. Even though teachers self-reported they were early adopters of technology, the program support structure was highly valued. The program could be used as a model for effective technology staff development.

ELEMENTARY TEACHERS' EXPERIENCES WITH TECHNOLOGY PROFESSIONAL DEVELOPMENT AND CLASSROOM TECHNOLOGY INTEGRATION: INFLUENCES OF ELEMENTS OF DIFFUSION AND SUPPORT

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CHAPTER 1

Introduction

Computer technology penetrates almost every aspect of life today, yet educational settings do not embrace such technology in the same manner as other professions. In order for schools to best serve children in a technological age, they need to integrate technology more effectively. Papert starts out his book *The Children's Machine: Rethinking Schools in the Age of the Computer* (1993) explaining that a doctor from one hundred years ago could not function in a modern medical facility, but a teacher from one hundred years ago would find the commonly used tools of the teaching profession basically the same.

Computers were introduced to the classroom starting in the late 1960s and early 1970s with the introduction of programmed instruction. The software *SuccessMaker* is a current application schools use with its direct roots in this behaviorist based programmed instruction. During the 1980s with the introduction of more affordable computers and a variety of new hardware and software, computers were introduced to more classrooms. These new technologies also brought about the introduction of more constructivist approaches for using technology with programs such as LOGO. During the 1990s, the International Society for Technology Education developed the National Educational

Technology Standards (NETS) with an emphasis placed on creating national guidelines for education in all content areas. Despite over forty years of various kinds of computer technology being present in the classroom and a decade and a half of technology standards in education, computer technology is not commonly integrated into classroom instruction. This is alarming given the nature of the technology dependent global society. Students must be prepared for a technology driven workforce. For some children, the only exposure to computers they receive is at school.

May (2000) examined approximately 600,000 job openings and found 450,000 or three out of four were related directly to technology and knowledge of computer applications. The percentage of jobs requiring some kind of technology skill is probably even higher today. Given that providing technology skills is a requirement for future employment, the United States education system needs to drastically improve the fact that only twenty percent of teachers feel prepared to integrate technology within their classroom (CEO Forum, 1998). Leaders in education must integrate computer technology skills into today's education system, and teachers must receive appropriate staff development opportunities in order to help them better instruct students for life in modern society.

Statement of the Problem

Elementary teachers have technology training opportunities available to them and many states, including Georgia, have mandated a technology course as part of recertification requirements. However, despite training mandates and opportunities, elementary educators do not frequently integrate technology within the curriculum in classrooms. Research documents the lack of technology integration among teachers and

answers some questions as to why technology is not more frequently integrated in classrooms. One issue confronting teachers is while training opportunities are available in the way of short term courses, little follow up support is available to teachers within their own school and classroom.

The Office of Technology Assessment (1995), a government body furnishing information about technology in the United States to legislative bodies from 1974 to 1995, found that relatively few of the nation's 2.8 million teachers integrated technology into their teaching. Abbott (2003), in a report prepared for the Gates Foundation, found that over 53% of the teachers they surveyed do not routinely use technology in the classroom and over half the students responding to questionnaires reported that they use technology no more than once a week. With the exception of e-mail skills, the majority of teacher respondents in the study reported less than proficient technology skills and over 62% reported that not enough or barely enough support personnel are available. Seventy-four percent of respondents reported less than 15 hours a year of technology related staff development and 64% reported not enough time available from technology support personnel to deliver professional development activities. The study further indicated via multiple regression analysis that the technology skills of teachers have the greatest impact on integration and "the most prominent intra-factor correlations suggest a strong relationship between teachers' perceptions of adequate access to technology resources and availability of support personnel" (Abbott, 2003, np, summary of multilevel findings section). A 2005 national teacher survey commissioned by CDW-G found 80% of k-12 teachers are using computers mainly for administrative functions and only slightly more

than half are integrating computers into routine instruction (National Teacher Survey, 2005).

Technology training is a major factor that can help teachers develop positive attitudes toward technology and integrating technology into the curriculum (U.S. Department of Education, 2005; Reynolds & Morgan, 2001; Yildireim & Kiraz, 1999; Yildirim, 2000). For technology to be infused effectively and frequently in the classroom, technology training must go beyond basic technology skill development and involve activities which demonstrate ways in which teachers can use technology as a tool for teaching and reinforcing curriculum standards (Baylor & Ritchie, 2002; Becker, 2001; Redish, 1997; Reynolds & Morgan, 2001; Roberts, 2003; VanFossen, 2001; Wenglinsky, 1998). In addition to training, teachers need follow up support in order to become proficient technology integrators. Wilson et al. (2003) reviewed research on inhibitors to teacher use of technology. Need for more hands on training with technology skills and strategies for technology integration, alignment of computer purchases with curriculum, reduced class loads and demands on teacher time, support systems, and administrative support were all noted as inhibitors in their review of research. Di Benedetto (2005) found that trained teachers demonstrated positive attitudes toward using technology and used more technology than teachers who did not have technology training. However, even trained teachers did not show significant improvements in frequency of technology integration with students and in more student centered learning. May (2000) found that when teams of teachers from the same school attended technology training together and one teacher served as a mentor to the others, the training resulted in a three times greater gain on teacher Profiler scores, an instrument used to measure technology integration,

compared to teachers trained with no mentor support. An evaluation of the effectiveness of one-on-one follow up with Georgia Technology Integration (InTech) trained teachers found that participants who received one-on-one follow up assistance in integrating technology had higher levels of technology integration, but participants who did not receive follow up indicated they were not able to incorporate lessons learned in InTech (Davis, 2002). Despite documented needs for more technology support, schools typically spend less than fifteen percent of their technology budget on teacher development (OTA, 1995; Thurlow, 1999). Based on their research of California schools that received technology related grants and experienced technology integration success, Coley, Cradler, and Engel (1997) recommend a minimum of thirty percent of technology dollars be dedicated to teacher development initiatives.

Research Questions

The purpose of this study is to examine how elementary teachers involved in a technology teacher development initiative experience elements of diffusion, support, and technology staff development and how these experiences impact their classroom technology integration. A deeper understanding of teachers' experiences with these areas may provide insight into why there is an apparent gap between training and actual classroom technology integration. The following questions guide this research design and data analysis:

1. How do teachers experience the five elements of diffusion (complexity, triability, observability, relative advantage, and compatibility) in the area of technology integration in elementary schools?

2. How do teachers experience instructional technology support and the impact of support on their technology integration instruction?
3. How do teachers experience technology staff development and the impact of staff development on their classroom technology integration?

Significance of Study

This study is a significant addition to the body of research on technology integration because it focuses on a gap in the research on why, despite wide-spread training and more availability of technology, teachers are not routinely integrating technology within their classrooms. If training alone were the answer to the dilemma of teachers not integrating technology, all Georgia educators would be integrating technology routinely in student centered learning projects. Research demonstrates that technology trained teachers develop positive attitudes toward technology and integrating technology into the curriculum (U.S. Department of Education, 2005; Reynolds & Morgan, 2001; Yildireim & Kiraz, 1999; Yildirim, 2000), and that effective training involves activities which demonstrate ways to use technology as a tool for teaching and reinforcing curriculum standards (Baylor & Ritchie, 2002; Becker, 2001; Redish, 1997; Reynolds & Morgan, 2001; Roberts, 2003; VanFossen, 2001; Wenglinsky, 1998). While trained teachers demonstrate positive attitudes toward using technology, they do not show significant changes in frequency of technology integration with students and implementation of student centered learning technology integration projects (Di Benedetto, 2005). Research also informs us that factors of access, scheduling, modern technology, time, training, support, pressure to integrate, pressure of high stakes testing,

professional development opportunities, teachers' instructional philosophies, teacher background knowledge, and school leadership are key elements in creating technology rich teaching and learning environments (Abbot, 2003; Becker, 2000; Carlson, 2002; O'Dwyer, et al. 2004; OTA 1995; Sweet, Abromitis, & Johnson, 2004; Wegnglinsky, 2005). Additionally, low teacher perception of support, inadequate professional development, and low access to technology all negatively impact technology integration (O'Dwyer, Russel, & Bebell. 2004).

A small amount of research is starting to surface on the positive effects of support in addition to traditional training opportunities for teacher technology integration after training (May 2000; Davis, 2002). This study seeks to add to this body of research by examining teachers' experiences with access to support and ability to integrate technology within their classrooms during a professional development program. Research is also available on diffusion of innovations within systems (Rogers, 2006). By examining elements of diffusion, teacher support, and staff development experiences together, data collected and analyzed for this study can help inform how the three aspects of classroom technology integration impact teacher technology integration as a whole.

The three questions guiding this research were thoughtfully selected to examine elements of teacher development that are not widely apparent in teacher technology staff development opportunities and/or initiatives. The first question, addressing the elements of diffusion was selected because wide spread change takes place more rapidly when the five elements of diffusion are present. The elements of time, access, complexity, and match between teaching philosophy and technology, were all mentioned in the research as elements which affect teacher use of technology (Abbot, 2003; Becker, 2000; Carlson,

2002; O'Dwyer, et al. 2004; OTA 1995; Sweet et al., 2004; Wegnglinsky, 2005). Observability, seeing others use technology within their classrooms, and triability, being able to try out technology in a non threatening environment, are also elements of diffusion which need to be examined. Despite the mention of these elements in texts used in courses focusing on teacher development in the area of technology integration, this does not seem to be an area specifically examined when planning teacher development opportunities. The text *Educational Technology in Action: Problem-Based Exercises for Technology Integration* (Roblyer, 2004) used at Georgia State is an example of a text that mentions these elements. Data analyses in this area can provide insight on how these traits are or are not present in elementary schools and can guide changes needed in elementary school environments to make these elements of diffusion more apparent.

Questions two and three of the study deal with teachers' experiences of support and ability to integrate technology within their classrooms following a technology teacher development program. The literature makes it clear that support is an important element of technology integration among teachers but is not specific about how to provide this support. This study can add to the literature on support by providing more specific details on ways in which support impacts classroom technology integration. Additionally, this study can provide further insight on how teachers experience technology staff development and what aspects of staff development impact their classroom technology integration the most. This addition to the knowledge base can help shape the effectiveness of future technology staff development opportunities impacting classroom technology integration.

Rationale

Technology integration standards (Appendix A) guide teachers in what they are supposed to know and what their students are supposed to learn. The National Educational Technology Standards for Teachers and Students shape state standards in the area of technology integration. Georgia has embedded these standards within the content area Georgia Performance Standards. In addition, Georgia required all teachers to take a technology course centered on integration of technology within the curriculum as part of teacher education programs or for recertification of in-service teachers. The deadline for all Georgia teachers to meet this requirement was the summer of 2006. Despite the presence of standards which are supposed to guide educational practices with regard to technology and despite wide spread availability of technology training, many teachers are still not integrating technology frequently in instructional practices.

The researcher in this study experiences technology integration in school environments in her roles as an elementary educator, staff developer, and teaching assistant at a university. In these various roles, she observes a need for more teacher support in the area of technology integration and technology resources to make it easier to integrate technology. Inequities between schools within the same district in terms of technology resources available to students and teachers and lack of human resource support for technology integration directly available to teachers are also concerns of the researcher. Conversations with colleagues about technology integration often indicate teachers' frustration with technology resources, especially in the area of support personnel. The researcher's experience teaching a masters level course on technology integration involving students from many school systems over the last few years allows

her to observe how the frustration with lack of on-going support and resources is not isolated to just the school system in which she works as an elementary teacher. It is her experience that teachers have a desire to integrate technology, even when they have minimal technology skills themselves, but lack the support to help them develop in this area. Furthermore, she observes that some people whose job description requires them to help teachers with technology integration lack the necessary skills and/or patience to support teachers in the area of technology integration. Technology decisions about purchases and training made without a thorough understanding of technology hardware or software, curriculum objectives, and the limitations of school structures are concerns of the researcher. Having spent most of her nine years of teaching elementary school in a portable classroom, outside the main school building, in which her main access to computers for classroom integration was a mobile computer lab, she often found herself frustrated when planning technology integrated lessons. The school did not have a stationary lab, the laptop cart could not be pushed through the exterior doors of the building, and the portable classrooms were not wireless accessible so the laptops would not work even if students carried them from the building to the classroom. Much of her thinking about these aspects of technology integration came out of what she learned in her graduate school course on diffusion of innovations and systems theory. This course encouraged her to think critically about the many facets of school systems which inhibit or promote technology integration. It is for this reason, that one of the research questions examines the five elements of diffusion. This question was included because teachers often do not (a) have time to learn new technology and incorporate it in lessons, (b) have access to resources or are unaware of resources they have access to, (c) have a chance to

observe others using technology or the finished products of technology lessons, (d) have user friendly, timely resources making technology less complex and less distant from standards based, tested curriculum, and (e) have opportunities to try new technologies.

The researcher's passion to conduct research in this area grew with her pilot study for her ethnography courses in which she studied the effects of one-on-one mentoring geared towards individual teacher's needs with technology integration within her own classroom. The six teachers who participated in this study all indicated that it was the most worthwhile technology related professional learning they had experienced. With her presentation of the results at the 2005 Georgia Educational Technology Consortium (Bryant, 2005) and conversations during and after her presentation, she found that she was not the only person seeing a need for more teacher support if technology is going to be incorporated more frequently and at broader levels in schools. This study can add to the literature on how support and elements of diffusion can lead to teacher technology integration within their classrooms. It can also shape future educational practice in how technology staff development should be conducted for maximum effectiveness.

Definition of Terms

The definitions of the following terms are included to clarify implied meanings of these terms throughout this research.

Technology Integration – Technology Integration refers to the use of any technology within the classroom setting in order to teach student learning objectives. The main components utilized in this study are computers, interactive white boards, LCD projectors, student response systems, computer software applications, audio recording devices, movie recording devices, digital cameras and internet based resources.

Technology integration can take on many forms including, but not limited to the following: showing instructional videos to students, student creation of their own digitally edited videos on a topic, writing essays in a word processing software application, creating multimedia presentations on a given topic, and researching using databases and the world wide web. Technology integration can also be thought of in terms of lower to higher levels of integration. Students are typically more passive in their participation in lower levels of technology integration and very engaged and involved in complex, cooperative problem solving in higher levels of technology integration (Dwyer et al., 1990).

Computer Technology Integration – Computer technology integration relates to incorporating a computer in the teaching and learning process when designing lessons to address curriculum objectives.

Constructivist Methods of Computer Technology Integration – Constructivist methods of computer technology integration involve students engaging in the learning process and learning more about both curriculum standards and technology as they work on projects to further their learning. Constructivist methods of technology integration involve teachers planning to use technology in a constructivist learning framework in which students are actively engaged in the learning, problem solving process.

Behaviorist Methods of Computer Technology Integration – Behaviorist methods of computer technology integration involve students using technology to practice skills. Behaviorist methods of computer technology integration usually involve packaged software applications in which students proceed through a variety of reading and math related activities by following the directions on the computer screen. As students answer

questions correctly or incorrectly, the questions become more difficult or easier and the software may provide a tutorial on how to solve a problem if questions on a topic are repeatedly answered incorrectly. Some of these programs are currently taking on a more video game type appearance.

Teacher Development – Teacher development is the process of improving a teacher's instructional skills. Teacher development opportunities may consist of one time training sessions, training sessions over a period of time, reflecting on one's practice, mentoring experiences, and coaching experiences. The most common teacher development opportunities are courses teachers can take as Professional Learning Units for certification renewal. In Georgia, a course called Integrating Technology (InTech) or a similar course which met the same technology criteria was required for certification renewal prior to the summer of 2006. This was a 50 hour training course taken during the summer or during the school year, and it served as the primary technology related teacher development course for Georgia teachers.

Systems Theory - Systems theory seeks to understand the interrelatedness of the parts of a system and how one part affects other parts. Applying the concept of systems theory to schools takes into account the various aspects of a school, school system, and state and national policy on a given school goal. In the case of technology integration, state and national standards, staff development opportunities, local school access to technology, and technical and instructional support are all different aspects of the system which can aid or inhibit teacher technology integration.

Diffusion – Diffusion of new ideas involves communication via social channels and when diffusion of new ideas are accepted or rejected a social change situation occurs.

Diffusion theory is important in the area of technology integration and elementary education because it requires a shift or change in thinking in the social system of a school, school district, or even state and national policy which guides educational systemic thought. Five elements are linked to how likely a new idea will be adopted by a social system. The five elements are known as elements of diffusion and include complexity, triability, observability, relative advantage, and compatibility.

Triangulation Design - Triangulation design is a mixed methods research design where data are collected in a single phase and both quantitative and qualitative data are used to answer the research questions (Creswell, 2006).

Convergence Model - The convergence model of research is utilized when quantitative and qualitative data are analyzed separately to answer the research questions and then converged for further interpretation (Creswell, 2006).

Pragmatism – In this worldview, researchers are concerned about the practical implications of their research. More focus is placed on the importance of the research and the problem being addressed than on methodology. Multiple methods of data collection are utilized when operating under this worldview (Creswell, 2007).

Phenomenology – Phenomenology is a qualitative approach to research in which the researcher seeks to understand the essence of an experience among participants. Descriptions of the experience are provided after the research examines data sources for significant statements and then clusters these statements for meaning (Creswell, 2007).

Overview of Methodology

This study is a mixed methods triangulated study examining data collected from teachers enrolled in a technology teacher development initiative. A triangulated mixed

methods design involves collecting both quantitative and qualitative data simultaneously in a single phase design with all data used to answer the research questions. More specifically, a convergence model will be utilized in which quantitative and qualitative data are analyzed separately and then converged for interpretation of findings (Cresswell, 2006). Qualitative data will be collected within a pragmatic paradigm with a phenomenological qualitative approach. Research in a pragmatic paradigm seeks to have practical influences on reality. This study is pragmatic because it seeks to gain practical knowledge about teachers' experiences with elements of diffusion, support, and teacher development and how these experiences effect their classroom technology integration. Finding connections between these experiences and teacher classroom technology integration can help improve teacher development experiences in other school settings. A phenomenological qualitative approach is used when participants in a study are experiencing the same phenomenon (Cresswell, 2007). In this study teachers have all experienced the first year of a two year technology teacher development initiative within their school system.

Teachers participating in this initiative were enrolled in a two year technology staff development program in which they attended both face to face and online classes, make weekly reflections on their professional development web page journal (web log), implemented projects within their classroom, and posted these projects on their professional development web page. Teachers were near the completion of the first year of the initiative. Data sources for this study included teachers' online web log entries, teachers' responses to both quantitative and open ended survey questions, teacher interviews, and an interview with the initiative director. The data were analyzed using

descriptive statistics, frequencies and percentages, correlations, and by forming clusters of meaning or themes (Creswell, 2007). Descriptive statistics were used to enhance qualitative findings with more details about participants. Correlations were used to examine the relationships between answers to various questions. The goals of the study are to answer the three research questions on (1) presence of elements of diffusion, (2) teachers' experience with support, and (3) teachers' experience of technology teacher development and its impact on their classroom technology integration.

A mixed methods study was selected in order to gain an in depth understanding of teachers experiences with technology staff development. Quantitative data collection allowed for the expression of participants' views utilizing a survey instrument with a large sample size. Qualitative data collection allowed for deeper probing of how the experience impacted teachers. Combined the data provided the researcher with a thorough understanding of the staff development program. Research with such depth and breadth is necessary because the areas of teachers' experiences with elements of diffusion within their schools, availability of support, and impact of professional development programs on their classroom technology integration are not well documented in available literature. In addition, a review of available survey instruments on technology integration demonstrates a lack of questions related to teachers' experiences with availability of support and teacher development opportunities and how these elements impact their ability to integrate technology within their classroom. A strength of qualitative research is "the discovery of new hypotheses, and the description of how treatment interventions are implemented or of possible causal explanations" (Shadish, Cook, & Campbell, 2002, p. 478). This study examines a school system intervention of a teacher technology initiative. The findings can assist with the formation of new hypotheses of how to create more effective teacher technology staff development opportunities which have a greater impact on classroom technology

integration. Correlations were utilized in this study in order to show relationships among responses to quantitative survey questions in order to further understand teacher's experiences and the impact of these experiences on their classroom technology integration. Frequencies and percentages were calculated to create a more complete picture of the sample population.

Summary

Technology standards for teachers, students, and colleges which offer educational degrees have been set for those in education to follow in order to prepare students for life in current society (ISTE/NETS, July 19, 2004; NCATE, 2002). Despite the presence of these standards, over 53% of teachers do not routinely use technology in the classroom (Abbott, 2003). This study examined teachers' experiences with elements of diffusion within their schools and their ability to integrate technology while enrolled in a technology professional development program.

Descriptive statistics, correlations, and coding of themes were examined to create a picture of teachers' experiences of elements of diffusion within their school, support, and the impact of technology professional development on classroom technology integration. These analyses can lead to further understanding of how schools can be better primed for technology integration to take place with the existence of elements of diffusion and support systems. Additionally, the study can inform how to format teacher technology professional development opportunities for maximum impact on classroom technology integration.

CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

The focus of this dissertation is an examination of teacher experiences with teacher development, support, and elements of diffusion in relationship to technology integration within the elementary school context. This chapter serves as a review of literature related to technology integration. The study is primarily focused on how the presence or absence of Rogers' (1995) elements of diffusion (relative advantage, compatibility, triability, complexity, and observability) and support systems within the elementary school context impact the effects of technology related staff development on classroom practice. To a small degree the study focuses on other ideas presented by Rogers' (1995) including adoption categories and change agents. Literature is not currently available which examines the importance of both elements of diffusion and support in staff development programs which lead to classroom technology integration. It is for this reason, in the spirit of the concepts of systems theory in which the whole of a system is more than the sum of its parts, this chapter explores multiple concepts that impact or can impact technology integration within elementary schools.

The first section of this chapter, The Importance of Computer Technology Integration, focuses on three subsections: child development influences, positive impact

of technology on students and teachers, and meeting standards. Child development theory provides a framework from which educators can better understand how children learn and important factors to consider when building an environment and when establishing relationships that facilitate the learning of children. Child development theories and theorist have had a profound impact on how and why technology is integrated in a variety of ways within school settings, but they are often not referred to in articles on technology integration. Technology integration also has a profound impact on students and teachers as learners and facilitators of learning. With the need to engage learners of the information age and improve teacher quality in an era in which change is constant, this body of research demonstrates why staff development in the area of technology integration is warranted because of the positive results of integrating technology. The last part of this section informs the reader about the standards movement and the need for educators to be able to teach both subject oriented curriculum standards and technology integration standards. In summary, this first section seeks to answer why technology integration is important for children through a discussion of developmental theory, and through the literature on effects of technology integration, and addressing standards.

The second section of the literature review presents research on the history of computer technology integration and systems theory. Research on the history of computer technology integration aids readers in the understanding of how computers were introduced to the classroom environment and the theoretical underpinnings for this introduction. Through understanding the history of computers in the classroom, one can explore the behaviorist and constructivist frameworks of computer technology integration. This explanation of the history of computers in the classroom helps clarify

the later teacher development research section. Entry level technology integrators typically integrate in more behaviorist ways until they are comfortable with a new technology and then grow into integrating in more constructivist ways in which students conduct research, process information, and present information on real issues to real audiences. The second part of this section is a review of literature on systems theory. Systems theory serves as a framework for understanding system interactions, diffusions of innovations, adopter categories, and the use of change agents can impact how a new idea or concept becomes embedded in a system.

The third section is dedicated to research on factors that contribute to or inhibit technology integration. The first three sections of this chapter serve to build a framework of factors that should guide computer technology integration or impact computer technology integration. The fourth section focuses on research on teacher development. This section focuses on staff development standards from the National Council of Staff Development, teacher development research in the area of technology integration and research on mentoring and peer coaching.

Research is available on rate of technology integration among teachers, effective staff development strategies, stages of growth among teachers when learning to integrate technology, inhibitors to technology integration, factors related to change of systems when adopting new innovations including the impact of elements of diffusion, and positive impacts of support on teacher technology integration. Research is not available that examines the effects of teacher development, support, and elements of diffusion in a single context for understanding teacher technology integration. In an ERIC search on March 13, 2007, using the terms *teacher development*, *systems theory*, and *technology*

integration no articles were found containing all of the terms. By leaving the word development off of teacher development, three references were returned with none of the references coming from peer reviewed journals. When the term elements of diffusion, a component of systems theory, was used in place of systems theory no references were retrieved. Given that all of these areas impact teachers' technology integration; it is warranted to examine how teachers experience teacher development, support, and elements of diffusion and how the presence or absence of these elements promote or inhibit classroom technology integration. This chapter reviews the literature on each of these elements that are important in aiding teacher professional growth in the area of technology integration.

The Importance of Computer Technology Integration

Child Development Influences

Examining the theories of developmental psychologists may provide further insight into the importance of computer integration within elementary schools. Both B.F. Skinner and Jean Piaget had a direct impact on the ways computers have been integrated within the school. B. F. Skinner's teaching machine was the inspiration for later computer and software development focused on skill practice (Vargas, 2002). Piaget's work influenced Seymour Papert and his design of the Logo programming language for children (Papert, 2003).

Erik Erikson's theory, although not directly influential in computer technology implementation, may provide further insight into the importance of allowing children opportunities to use computers. Erikson's (1963) stage theory states that elementary school students are in the Industry vs. Inferiority stage. This stage is characterized by the

need for children to learn the valued tools of a society and win recognition by production. Erikson, in *Childhood and Society* (1963, p. 259), writes "the fundamentals of technology are developed, as the child becomes ready to handle the utensils, the tools, and the weapons used by the big people." Among modern tools of society, computer technology is extremely salient and important, and the ability to utilize a variety of technological tools is critical to being successful in many careers in American society (May 2000). Technology skills are highly valued by working adults in both American and international cultures, and children are exposed to adult use of technology on a daily basis. According to Erikson's (1963) theory, children must be able to use the tools they perceive to be important to adults, and adults must teach children of this age a broad range of skills that will give them the widest range of career choices in later stages. Children's natural inclination to enjoy working with computers may be a result of their understanding of technology as a tool of adulthood. However, an alternative interpretation for children's interest in computers is suggested by another theory, Glasser's choice theory. Glasser (1998) claims that the need for fun, as well as choice, belonging, and power, is genetic and that people tend to do what they perceive as fun. Research by Bryant (2003, 2004), Scherer (2002) and Resnick (1997) suggests that children enjoy computer related experiences and think of these experiences as playful (Bryant, 2003, 2004; Scherer 2002; Resnick, 1997), implying that technology in the classroom can help develop a positive attitude toward school.

Positive Effects of Computer Technology Integration on Students and Teachers

The Apple Classrooms of Tomorrow (ACOT) (Baker, Gearhart, & Herman, 1990) found that integrating technology has a profound impact on teachers and students and that

students performed as well as traditionally taught peers on standardized measures of learning even though they used class time learning how to utilize a variety of technology, and the greater attention on higher order, complex processing skills may have taken away from basic skill instruction. ACOT Report #7 (Baker et al., 1990) evaluates the first two years of the ACOT technology integration study using the Iowa Tests of Basic Skills, Iowa Tests of Educational Development, analysis of student writing samples, School Attitude Measure, Self-Concept and Motivation Inventory, and teacher, student, and parent interviews. Using these tools, ACOT researchers found that secondary students in ACOT classrooms were more capable of improving the quality of their rewrites on essays, many teachers reported a positive impact on their job interests and performance, and parents believed the project benefited their children in their child's knowledge of computers, attitudes towards learning, and achievement. ACOT researchers interpreted the ability of ACOT students to perform at the same level of traditionally schooled students as a positive outcome because of the significant changes in instruction that may have affected student results on a standardized test of basic knowledge (Baker et al., 1990). Additionally, ACOT researchers observed that teachers noted growth in their own abilities and viewed students' roles in the learning process as more active. This report demonstrated the need for further investigation into new assessment methods in assessing how technology affects the classroom environment. Researchers felt changes in student attitudes and level of thinking were present in their informal observations of ACOT classrooms.

ACOT Report # 21 (Sandholtz, Ringstaff, & Dwyer, 1994) addresses student engagement in relation to computer technology integration. Researchers noted positive

change in student engagement and increased enthusiasm when students used computers. The following teacher quotations provide insight into the engagement level of students while using computers: "The students don't get tired of working on the computer. They actually ask for things to do. In all of my years of teaching, I never had anyone ask for another ditto" (p. 7). And "It's incredible you get a few people who seem to pick it (LOGO writer) up and think it's great and all of sudden, the whole class does" (p. 7). The report also describes positive effects on on-task behavior, risk taking, and initiative. Although the overall report is positive, it does identify challenges, including (a) attention to frequency of use of software programs, because repeated use could lead to routine and boredom among students and (b) difficulty of assigned tasks because tasks that were too difficult or to easy were frustrating for students. They noted that even though students tend to be able to focus on tasks for longer periods of time when using a computer, students will reach a saturation point so timing of instructional use of computers is important.

Clements (1987) analyzed how different kinds of software applications engage students to various degrees. In her research, a drawing program demonstrated considerable student concentration and social engagement. Different kinds of programs elicit different types of peer and computer interaction. Wondering and hypothesizing were observed more in open ended software applications and discussions on correctness and winning were observed in more linear programs. She also found children using LOGO programming software became highly motivated to control their environment, engaged in self-directed exploration, and took pleasure in discovery. Brown (1996) reviewed the research on using computers for book or workbook like software

applications, word processing, and creating graphics through the lens of constructivist philosophies of teaching and learning. He concluded that the most constructivist and beneficial use of computers with young children was in word processing. He believes the overall value of computers in the classroom depend on quality of software and teacher modeling behavior and knowledge of software. ACOT Report #21, Clements (1987), and Brown's (1996) studies of software imply the need for teachers to utilize a variety of software applications in order to promote student engagement and utilize computers so they have a positive effect on student learning.

Bryant (2003, 2004), using methods based on Scherer's (2002) report of a study on motivation and learning conducted by Mihaly Csikszentmihalyi, found that fifth grade students perceived work on the computer to be more playful than other kinds of classroom activities. In Csikszentmihalyi's study, students carried a pager and recorded and rated daily activities upon being paged. Students appeared to learn the most when they recorded an activity as being both work and play. Extracurricular activities were the most commonly recorded activities to fall into the work and play category. In the Csikszentmihalyi study, students typically rated anything having to do with computers as highly motivating and more like play. Like Csikszentmihalyi, Bryant found that students perceived computer activities to be more playful than other classroom activities even when the computer activities required active participation in reading, research and writing.

The Need to Meet Standards

The 1990s brought about much work in standardizing curriculum at state and national levels. The National Council of Teachers of English in conjunction with the

International Reading Association began the process to create national standards in the area of English language arts during early 1990 (NCTE). The National Council of Teachers of Mathematics published their first set of standards, *Professional Standards for Teaching Mathematics*, in 1991 (NCTM). National Committee on Science Education Standards and Assessment (NCSESA) completed their draft of science standards, National Science Education Standards, in 1994 (NCES), and Curriculum Standards for Social Studies by the National Council for the Social Studies (NCSS) were also adopted in the same year. Technology standards were also developed in the 1990's. The National Educational Technology Standards (NETS) were developed by the International Society for Technology education with input from various educational organizations, including the organizations that created all of the previous standards mentioned above. The NETS have three components; NETS for students originally released in 1998 with a revised version released in 2007, NETS for teachers released in 2000, and NETS for administrators released in 2001. Additionally 49 states have aligned state technology standards to at least one of these three sets of standards for education (ISTE/NETS). The 1998 NETS for students included standards in the areas of (1) basic operations and concepts, (2) social, ethical, and human issues, (3) technology productivity tools, (4) technology communications tools, (5) technology research tools, and (6) technology problem-solving and decision-making tools. The 2007 NETS for students include the following six areas: (1) creativity and innovation; (2) communication and collaboration; (3) research and information fluency; (4) critical thinking, problem-solving, and decision-making; (5) digital citizenship; and (6) technology operations and concepts. The NETS for teachers includes standards in the areas of (1) technology operations and concepts; (2)

planning and designing learning environments and experiences; (3) teaching, learning, and the curriculum; (4) assessment and evaluation; (5) productivity and professional practice; and (6) social, ethical, legal, and human issues. The NETS for administrators include standards in the areas of (1) leadership and vision; (2) learning and teaching; (3) productivity and professional practice; (4) support, management, and operations; (5) assessment and evaluation; and (6) social, legal, and ethical issues. In addition to the NETS standards for teachers, schools of education that are accredited by the National Council for the Accreditation of Teacher Education (NCATE) must prepare teachers to integrate technology effectively into instruction in order to meet NCATE standards (NCATE, 2002).

In addition to these national standards, the state of Georgia also has standards for technology integration within its Quality Core Curriculum framework. The Georgia standards for technology integration are arranged in these categories; (1) basic skills, (2) communication, (3) problem solving/decision making, (4) productivity and research, and (5) societal and ethical issues (GA Learning Connections, n.d.). As Georgia is moving from the Quality Core Curriculum to the Georgia Performance Standards, technology integration goals are embedded into content area standards. For example: "uses a variety of resources (encyclopedia, Internet, books) to research and share information on a topic" is a second grade writing standard in the language arts section of the standards (Georgia Performance Standards, n.d.).

These national and state standards set the expectations for technology integration in education. They encompass more than basic computer skills and advocate for quality leadership to make informed decisions about technology integration, using the standards

to guide practice. Despite the implementation of technology standards in education, there is little difference between how students were taught in the 1990s to how they are taught currently (Wilson, Notar, & Yunker, 2003). The CEO Forum on Education (2001) reports a rise in teacher use of computers between 1998 and 2000, but only 33% of teaches felt they were either well or very well prepared to use technology within their classrooms. The majority of teachers (53%) felt somewhat prepared and 10% felt not at all prepared to use technology in their classrooms.

Gahala (n.d.) and Whitaker (1995) both focus on the need for schools to look at their curriculum first and technology hardware and software second. The technology purchased must fit the learning objectives and standards of the school. This is especially important because early majority adopters are very deliberate in their adopting a new innovation and late majority adopters approach adoption with skepticism (Rogers, 1995). A focus on standards would appeal to these two adoption categories making it easier for more teachers to value technology integration and in turn more eager to adopt new technology. With two thirds of people typically falling in the early majority and late majority categories of adoption (Rogers, 1995), it is imperative that curriculum is the central focus of computer use in order to appeal to the large majority of adopters.

Factors that Contribute to or Inhibit Technology Integration

Factors of access, time, training, support, and teacher background knowledge have been identified as key elements in creating technology rich teaching and learning environments (Abbot, 2003; Becker, 2000; Carlson, 2002; O'Dwyer et al., 2004). Access to technology can sometimes be misleading because computers are present, but they may be so out of date that they are not practical and timely to use. According to the Office of Technology Assessment (1995) report, outdated technology is a major issue facing

elementary school classrooms. At the time of the report, about half of all classroom computers were older models that would not support the current networking, software, and hardware that could be used to enrich classroom instruction. The report indicated that while the United States leads the world in numbers of instructional computers in schools, it fell below other nations in up-to-date technology access. The Georgia Department of Education Plan, developed between November 2001 and June 2003 (n.d.), indicated that only 78% of classrooms in Georgia had at least one "modern" internet connected computer and that only 25% of classrooms had at least three such computers present. A modern computer is defined as "equal to or better than a Pentium III or comparable Celeron or Athlon processor or equal to or better than a Macintosh G3" (endnotes of report). Currently, a computer labeled as modern in Georgia could be over eight years old if it entered the school in 1999 when such processors were first introduced. Additionally, with the growth of metropolitan school districts, portable classrooms are becoming common at many schools. This adds an extra barrier to access because school systems often adopt wireless technology such as laptop carts without insuring that portable classrooms have wireless internet access and the ability to transport the carts from a central location to their classroom. This creates a digital divide between those classrooms that are located in the building and have access to mobile laptop carts and classrooms that are located in portable buildings. This divide between classrooms is often compounded by the removal of computer labs to make space for additional classrooms, leaving a large percentage of the student body in some schools with minimal access to technology that can be integrated.

Romano (2003) in his book, *Empowering Teachers with Technology*, lists six barriers to technology integration. The six barriers are: lack of a coherent vision, lack of teacher empowerment with technology, misconceptions of teacher's roles when utilizing technology, lack of course specific software, ill-conceived and incompatible utilization strategies, and lack of understanding among educational leaders to grasp how technology can make learning more effective and efficient. Romano believes that a "Technology-Enhanced Curriculum" needs to be developed that will provide teachers with the resources needed to enhance their teaching. This curriculum would be designed so that teachers do not have to spend valuable time creating all curriculum units from scratch. These technology-enhanced curricula would include video, audio clips, and other resources readily available to teachers so they could show students historical or scientific events actually happening. Romano illustrates how doctors routinely use technology such as CAT scans in their diagnosis of patients, yet they did not have to develop the technology and the technology is readily available to them. He believes teachers will be empowered to use technology more effectively if provided with the resources needed to seamlessly integrate it into the curriculum.

O'Dwyer et al. (2004) in the Use, Support and Effect of Instructional Technology (USEIT) study questionnaire found local school pressure to integrate technology, school availability or access to technology, professional development focused on integrating technology, high technology confidence in using technology, and teacher's more constructivist teaching philosophy all are high indicators of technology integration. The study further stated that low teacher perception of support, inadequate professional development, and low access all negatively impact technology integration. Becker (2000)

found similar findings in analyzing data collected in The Teaching, Learning, and Computer (TLC) Survey of over 4,000 teachers in over 1,100 schools in the United States. He found that five factors contribute to technology integration or the lack thereof. The five factors are: scheduling, pressure of curriculum and high stakes testing, access to technology, teacher expertise with using technology, and teaching philosophy. In line with Becker (2000) and O'Dwyer et al. (2004) who name teaching philosophy as a component of whether teachers integrate technology, Wenglinsky (2005) illustrates how technology rich learning environments are more in line with constructivist learning and teaching philosophies. Sweet et al. (2004), in data collected in high-performing and high-technology schools, found that teachers attributed their frequent use of technology to the following: (a) whether they had easy access to technology, (b) whether there were sufficient staff development opportunities, and (c) whether the school leadership set curriculum-centered goals. The majority of the schools studied had computers both in the classroom and in at least one computer lab, and the focus of the school was on a small number of priorities for students.

Issues surrounding support and staff development are apparent in the literature as inhibitors to classroom technology integration. In addition, teacher philosophy can inhibit technology integration because of a gap between teaching philosophy and instructional uses of technology. These inhibitors can also be understood in the framework of elements of diffusion: complexity, triability, observability, relative advantage, and compatibility (Rogers, 1995). The element of complexity deals with the match of an individual's views and his/her perceived understanding of what advantage using a new technology can provide (Rogers, 1995). Teachers who have a more constructivist philosophy typically

are less inhibited to use technology (O'Dwyer et al., 2004; Becker, 2000; Wenglinsky, 2005. The elements of time and access are mentioned as inhibitors to integration (Abbot, 2003; Becker, 2000; Carlosn, 2002; O'Dwyer et al., 2004). Teachers need time to learn new technology and time to figure out how best to integrate it in their lessons. Access to technology hardware, software, and human support are inhibitors to technology integration (Abbot, 2003; Becker, 2000; Carlosn, 2002; O'Dwyer et al., 2004). Time and access issues relate to relative advantage and compatibility. Limited access brings about limited triability of technology and the ability to observe others integrating technology. It is for this reason the elements of teachers' experiences with support and appearance of elements of diffusion with a teacher development initiative are the primary focus of this study. Learning more about these areas can help overcome inhibitors to technology integration and lead to more effective staff development that has a stronger impact on classroom technology integration.

Historical and Theoretical Frameworks

A Historical Framework of Computer Technology in the Schools

Computer technology emerged in early childhood school settings in the 1960s and 1970s. Early use of computers in education settings, stemmed from behaviorist perspectives of teaching based on Skinner's theories (Vargas, 2002). These first computer programs in schools were called programmed instruction (PI) and did not have a long existence in the school curriculum. Skinner first developed a "teaching machine" in which children practiced basic math facts on a machine and received immediate feedback as to the correctness of their answers. Skinner was not satisfied with his initial teaching machine because it did not have step by step instructions for guiding students toward

mastery of math facts. Programmed instruction was developed in order to guide students through the steps of solving a problem much like a tutor would guide a student. Skinner thought that programmed instruction was better because it provided students guided math instruction at their learning level (Skinner, 1966; Vargas, 2002). Patrick Suppes, another behaviorist, has also had a wide spread influence on computer use in elementary education. In 1967, Computer Curriculum Corporation (CCC) was started by Suppes and his colleagues at Stanford University's Institute for Mathematical Studies in Social Sciences. This company used behaviorist principles in designing computer assisted instruction in which students can receive subject area practice at their individual learning level. In these programs, students progress through lessons that automatically adjust according to student responses to questions. Suppes did not believe in negative reinforcement, so his software was programmed to use language such as *try again* instead of words like *incorrect* or *wrong* if a student did not answer correctly (Druin and Solomon, 1996). The software program *Success Maker* is a current example of the works of the Computer Curriculum Corporation and is marketed under the umbrella of Pearson Digital Learning (2004).

The mid 1970s through the mid 1980s brought more affordable personal computers. Although most programs of this time period reflected behavioral philosophies of learning and were more drill and practice in nature, constructivist theories of learning were starting to penetrate how software was designed and how computers were used with children. The programming language *LOGO* marked the introduction of constructivist theory and computer use in early childhood education. This computer program, designed by Seymour Papert, enabled children to program the computer to make designs and is

based on Piagetian constructivist perspectives of learning. Papert worked for five years in Piaget's center in Geneva, and it was at this time that Papert became interested in how children think (Papert, 1993).

Until the 1980s computing was very limited, with simple graphics and text being the primary use. The multimedia boom of the late 1980s brought many possibilities to enrich learning within the school. Sound cards, video, CD-ROMs, laser disk players, computer graphics, animation, and virtual environments brought computing to a new level. However, the introduction of multimedia did not necessarily change the notions of how school should be conducted. Some multimedia software packages were still based on behaviorist theories, while others allowed for a nonlinear, creative approach based on cognitive theories of learning (Willis & Mehlinger, 1996). The year 1985 marked the beginning of the Apple Classrooms of Tomorrow research (ACOT, 1995). This research began with the question "What happens to students and teachers when they have access to computers whenever they need it" (p.4). This research project, that continued through the 1990s, addressed how teachers and students change when they use technology. ACOT found that as teachers utilized more technology, their teaching ideologies often changed and created an environment where teachers acted more as guides to learning rather than using lecture approaches to learning.

Although the kinds of technologies available to educators have changed dramatically throughout education and although new technologies are widely available in many classrooms, no substantial, widespread shift in pedagogy can be observed with the utilization of these new tools for learning. Massachusetts Institute of Technology's (MIT) Lifelong Kindergarten (2003) provides a new look at computer technology. Researchers

associated with the Lifelong Kindergarten advocate the view that today's technologies can expand the possibilities of what people can design and create in the same way that blocks and finger paint encouraged design and creativity in a traditional kindergarten. The ultimate goal of the MIT Lifelong Kindergarten Lab is "a world of playfully creative people, who are constantly inventing new possibilities for themselves and their communities" (MIT, 2003). The philosophy of the Lifelong Kindergarten Lab is to invent technologies that aid in learning and creativity in the same way that Frederick Froebel contributed his "gifts" to the kindergarten (MIT Lifelong Kindergarten, 2004). Froebel, the father of kindergarten, believed children's learning experiences could be enriched with his "gifts," a series of twenty educational toys that included building blocks, modeling clay, sewing kits, parquetry tiles, origami papers, as well as other objects for manipulation and creative expression (Brosterman, 1997). The ideas of MIT's Lifelong Kindergarten, shaped by Papert's work with Piaget, follow a constructivist approach to understanding how children learn. Resnick (1997) is continuing to expand the MIT Lifelong Kindergarten as it continues to develop technologies to expand creativity and problem solving among children and teenagers.

A historical look at computer technology integration allows educators to better understand the how computers are used in schools, why computers are used, and theoretical views of learning with computers. Computers are still being used in a variety of ways and computer software is still being created with both behaviorist and constructivist theoretical foundations of learning.

Theoretical Systems Theory Framework

Systems Theory is a theoretical understanding formed in the 1950s to address the need for understanding the interrelatedness of parts of individual systems and generalizability across types of systems because of the increased complexities of the modern era. The theory was developed by scholars in a variety of disciplines who shared a concern with the lack of a unified, disciplined inquiry method to aid with understanding complex ideas across disciplines. The theory took an opposite approach to the common focus on specialization which allowed knowledge to be gained, but did not take into account how the interactions among parts might be important to further advancement (Banathy, in International Society for the Systems Sciences, n.d.). Bertalanffy (in International Society for the Systems Sciences, n.d.), one of the founders of General Systems Theory, states "it is necessary to study not only parts and processes in isolation, but also to solve the decisive problems found in organization and order unifying them, resulting from dynamic interaction of parts, and making the behavior of the parts different when studied in isolation or within the whole" (n. p.). Bertalanffy (1969) sought to advance science by emphasizing that individual parts do not always operate the same in isolation, as they were commonly studied, as they do within a system.

According to Chen and Stroup's (1993) historical overview of systems theory, the theory can be traced back to Aristotelian thought that the whole is more than the sum of its parts. Systems theory as a construct began in the 1920s and had been applied to biological phenomena, physics, and thermodynamics. During the 1940s, Weiner combined systems theory, control theory, and information theory and applied them to social, biological, and mechanical systems. Weiner advanced systems theory in the

understanding of feedback mechanisms and goal-directed behavior. General systems theory as a field is attributed to Bertalanffy who published the theory in 1955 (Chen & Stroup, 1993).

Rogers (1995) applies systems theory to how new ideas are diffused within groups of people. Rogers' systems concepts are applied across many fields in order to create systems that promote the diffusion of new ideas and the progress of a given system. Rogers' (1995) systems theory concepts are often applied in the area of instructional technology because of the focus of instructional technologists in assisting people in adopting new technologies. An awareness of the systems in which instructional technologists work, can help them change aspects of the systems that inhibit the adoption of a new technology and add elements to the systems that would expedite the diffusion process. This study focuses primarily on the five elements of diffusion as listed by Rogers (1995), the role of support, which can be linked to the role of change agents, and to a small degree adopter categories which are also described by Rogers (1995).

Systems theory, when applied at an operational level, provides a framework for looking at how systems, in this case school systems, operate. This section of the theoretical framework examines literature related to school systems and how they need to improve the workings of the system in order to improve technology integration. In order for change to take place, one must understand how the system works and make appropriate changes within the system in order to guide change. Additionally, elements of change need to be understood and environments need to be created in which teachers are able to observe and understand the five elements present in the diffusion of an

innovation. The five elements of complexity, triability, observability, relative advantage, and compatibility all affect how a person adopts a new innovation (Rogers, 1995).

Often, change agents are used in reshaping a system. The Apple Classrooms of Tomorrow research (ACOT, 1995) found that when teachers were able to observe other teachers integrating technology, they were more likely to believe they could also integrate technology. Using the knowledge gained from ACOT on teacher development and technology integration (ACOT, 1995), faculty could be put in place to operate as change agents, training others according to sound teacher development research. School systems can learn from Roger's (1995) Systems Theory when trying to raise the level of technology integration within their school system. This theory looks at change by analyzing the elements within the system that promote and inhibit change. Rogers (1995) also explains the role of change agents working within systems to promote systemic change.

Rogers classifies individuals into adopter categories, ranging from early adopters to laggards, in terms of how they embrace or resist change. According to Rogers (1995) one's level of innovativeness determines the adopter category he or she will belong to. The levels of innovativeness range from high to low resulting in group membership in each of the following five categories: innovators, early adopters, early majority, late majority, and laggards. Also, the level of support from multiple sources affects the rate at which change happens (Rogers, 1995). Systems must make sure the appropriate level of financial, capital, and human resource support is present in order to have effective change within the system. School systems wishing to integrate technology must have a plan that accounts for purchasing of the appropriate hardware and software for technology

integration, as well as providing the personnel capable of supporting teachers at all levels of adoption in integrating technology into their classroom. Wahl (2000) suggests that 70% of technology funds should be spent on professional development and the remaining 30% of funds be spent on technology infrastructure needs. Fitzgerald (2001) recommends that 15 to 30 percent of a school district's technology budget be allocated for staff development. These articles on technology staff development funding point to the importance of a large percentage of funding being dedicated to staff development, but their discrepancies point to the need for more research on effective technology staff development models so more detailed funding formulas can be outlined.

Teacher Development

National Staff Development Council Standards for Teacher Development

The National Staff Development Council (NSDC) is the largest non-profit organization focused on improving education for all students by focusing on quality staff development for educators. The NSDC developed standards in 2001 for staff development of teachers. The standards include context standards focused on building learning communities, leadership that continually guides instructional improvement, and provision of resources that support learning. The process standards focus on using student data to inform instruction, applying research in decision making, matching strategies with goals, applying knowledge about learning and change, and collaborating with others. The content standards focus on working with diverse students, preparing learning environments, deepening content knowledge of educators, and family involvement. The full list of standards can be found in Appendix B.

The NSDC standards can be aligned with No Child Left Behind (NCLB) standards for professional development with the exception of the NCLB standard vi on recruitment of highly qualified teachers. This is because the NSDC focuses on educators who are already in the profession (Hirsh, 2006). The NSDC advocates for on-going staff development experiences that serve educators based on intended outcomes of staff development and educators' prior knowledge and experience. They warn that teacher awareness of new ideas can be achieved in large group, short presentation sessions or workshops, but such sessions are unlikely to have effects on teachers' classroom instruction.

> For many educators, staff development is synonymous with training, workshops, courses, and large group presentations. … They are also often unaware that training sessions and coursework must include numerous live or video models of new instructional strategies, demonstrations in teachers' classrooms, and coaching or other forms of follow-up if those strategies are to become a routine part of teachers' instructional repertoire (NSDC, n.d, designs and strategies section).

Asa Hilliard III (1997) in his keynote address to the NSDC's 1996 annual conference noted seven senarios common in exemplary staff development that impacted student achievement in schools that previously were struggling with student academic success. Hilliard compiled this list of senarios after examining successful staff development programs that lead to increased student achievement. The seven senarios were: (a) a master teacher demonstrated with students successful models of instruction and were available for observation and critiques, (b) the staff developer followed an internship model in which they were physically present the majority of the time when teachers were being trained, (c)

the staff developer shared the theoretical background of their successful model, (d) the staff developer provided ongoing and focused feedback to teachers being trained within the classroom setting, (e) reflection was key in the staff development experience and time was dedicated for reflection, (f) specific techniques were taught, and (g) affective components of the staff development models seemed to be key in their success.

Successful staff development can be achieved by various means, but needs follow-up beyond training sessions and course work if the staff development is to become part of teachers' routine instructional practice. As noted in the characteristics outlined by Hilliard (1997), relationships between the staff developer and those receiving the staff development aid in the growth of teachers and the actual implementation of new strategies within the classroom.

Teacher Development and Technology Integration Research

The ACOT research (Dwyer, Rignstaff, & Sandholtz, 1990) suggests that teacher development in the area of technology integration takes place in five stages. This process is a time consuming process and takes several years for teachers to move from the Entry Stage of using a computer in very basic ways to the Appropriation Stage in which teachers adjust their way of thinking about learning and technology use. The first three stages require teachers to become comfortable with using technology to varying degrees, but no real change is noted in classroom practice. The first group of teachers studied by ACOT reached the Appropriation Stage, the stage that is noted by change in classroom practice, in the second year of the project. Using teacher web logs, weekly reports, classroom observations and interviews as data sources; ACOT found that movement into

this stage of development happened when teachers experienced personal mastery of technology and came to understand and use technology effortlessly as a tool for real work completion. At the time of publication of this stage theory of research, the Invention Stage was created as a place holder to show further possibilities for technology integration, but was not observed in the original data collection. Table 1 presents the developmental stages that teachers advance through when learning to integrate technology within the classroom (Dwyer et al., 1990).

Table 1

Stages of Teacher Development in Relation to Technology Integration *(Dwyer et al., 1990)*

Stage	Examples of what teachers do
Entry	Learn the basics of using the new technology.
Adoption	Use new technology to support traditional instruction.
Adaptation	Integrate new technology into traditional classroom practice. Here, they often focus on increased student productivity and engagement by using word processors, spread-sheets, and graphic tools.
Appropriation	Focus on cooperative, project-based, and interdisciplinary work-incorporating the technology as needed as one of many tools.
Invention	Discover new uses for technology tools, for example, developing spreadsheet macros for teaching algebra or designing projects that combine multiple technologies.

After careful study of how teachers develop with the use of technology integration in their classroom, ACOT (Yocam & Wilmore, 1994) sought to create a context for teacher development in the area of technology integration. A Report on 10 Years of ACOT Research (1995) found that five elements contributed to effective staff development for technology integration. The five elements are: (1) small-group

collaborations among teachers, (2) teacher development in actual classrooms, (3) staff development built on teachers' existing knowledge about curriculum and practice, (4) provision of opportunities to experiment and reflect on new experiences, and (5) provision of ongoing support to help implement change and innovation.

May (2000) and Davis (2002) both found that teachers who experienced mentoring and/or follow up support to technology training integrated technology more frequently than teachers without such support. May (2000) evaluated mentoring follow up to technology training and found that when one teacher serves as a mentor to other teachers receiving technology integration training, a three times greater gain on teacher Profiler scores was achieved by mentored teachers as compared to non mentored teachers. In addition, teachers indicated that their mentor promoted confidence in using technology and increased their ability to work through technical issues. As a result, mentored teachers demonstrated a desire to continue to integrate technology. Davis (2002), in an evaluation of the effectiveness of one-on-one follow up with Georgia Technology Integration (InTech) trained teachers, found that participants who received one-on-one follow up assistance in integrating technology had higher levels of technology integration, but that participants who did not receive follow up indicated they were not able to incorporate lessons learned in InTech. Follow-up programs or mentoring systems are necessary after the initial technology integration training to foster collaboration and support, to address daily challenges, and ultimately to have more frequent and effective use of technology in the classroom (Carlson, 2002; Di Benedetto, 2005; May, 2000; Davis, 2002; O'Dwyer, Russel & Bebell, 2004). The body of research

on mentoring and peer coaching as elements of staff development will be discussed further in the next section.

Wilson et al. (2003) interviewed 50 full time elementary teachers who had received university training in technology integration to see how they were utilizing computers in their classroom. Nearly half of these teachers utilized the internet for less than one hour a week or not at all, and over a quarter of these teachers utilized a computer for classroom purposes less than one hour a week or not at all and had students use a computer for less than one hour a week or not at all. Overall students averaged 30 minutes a day on the computer in this study with most of that time spent on the internet or using a CD-Rom. Wilson et al. expressed concern for the state of technology integration among these teachers. Despite having both university coursework and professional workshops in a variety of computer skill development, teachers still reported little use of computers in their classroom for instructional purposes and reported that they had limited proficiency in their own computer skills. This study indicates how technology courses and workshops alone are not capable of significantly changing the way technology is integrated within the classroom. Sexton, King, Aldridge, & Goodtadt-Killoran (1999) evaluated preservice early childhood educators' attitudes towards computers using the Computer Attitude Scale (CAS) developed by Selwyn. Although they found that students who filled out the scale demonstrated positive computer attitudes in general, answers to questions on the scale indicated that teachers felt they needed someone more knowledgeable about computers to tell them the best ways to use a computer and that they could not teach themselves most of the things they needed to learn using a computer. It also appeared that students who had home computers tended to hold significantly more

positive attitudes towards computers. In discussing the results of their analysis of student responses to the CAS, they recommend that people who do not have home computers may need additional time and assistance with computers. Also, they need computer experiences that increase levels of perceived control of use and are likely to decrease computer anxiety. These studies on teacher development demonstrate the need for a strong support system for teachers who are learning to integrate technology within their own classrooms.

Carlson (2002) states that teacher training is the key determining factor for integrating technology to improve student performance. He advocates teacher training that includes the three dimensions of: (1) initial training that prepares teachers to proficiently use a variety of educational resources including technology, (2) workshops, seminars, and short course in-service training that develops technology skills and how to use their skills in the classroom, and (3) ongoing pedagogical and technical support for teachers in order to address daily challenges of teaching. Carlson advocates administrative support of technology integration by providing teachers adequate time to participate in technology training and integration without using too much personal time. Dias (1999) explains how teachers are being asked to change in two ways when they integrate technology. Teachers must adapt both to new tools for instruction and to the manner in which they teach their students. These two dynamics can change the role of the teacher, the role of the students and the physical classroom set up. These new tools of instruction are also sophisticated and therefore require more teacher development in their use than other tools that have been introduced into the classroom, such as overhead projectors or televisions. She states that “lack of leadership, financial support, or an on-

site technology expert sends many integration efforts into a tailspin"(p. 12). Parks and Pisapia (1994) found three factors contribute to teacher development and technology integration. The three factors are "(1) motivation and commitment to student learning, and their development as teachers, (2) support and collegiality teachers experience from their school through on-site help and peer training, and (3) access to technology in sufficient quantities (p. 2)." Thurlow (1999) found that the teachers who integrate technology most frequently place a high value on one-on-one training and were 40% more likely to begin using computers because of the suggestion of a technology coordinator rather than their own initiative. Despite knowing that technology staff development and on-going support is important for effective technology integration, articles focused on technology training models are difficult to find (Thurlow, 1999).

These studies validate the foundational Apple Classrooms of Tomorrow research, in which a process of teacher development in relationship to technology integration was laid out. The studies also confirm the elements of effective teacher development through both technology coursework and support within teachers' own classrooms as necessary to aid teachers in moving from low level to high level technology integrators. Becker, Ravitz, and Wong (1999) noticed a change in teaching objectives related to technology tools as moving from "practicing skills just taught" and "learning computer skills" to gaining access to information and improving student writing. This change in teacher objectives for using technology shows a shift from using technology to practice skills via drill and practice software applications and learning about various aspects of computers to actually utilizing computers as a natural tool in the teaching and learning process to access, process, and present information learned. The nine year difference between the

beginning of the ACOT studies in which the first stages of teacher development in relationship to technology integration center around “learning to use computers” and “practicing skills just taught,” and the Becker et al. study in which teachers noted technology as a tool for accomplishing access to information and improving student writing may show a trend towards teachers acceptance of computers as a tool for learning rather than an item to be learned about.

After careful study of how teachers develop with the use of technology integration in their classroom, ACOT (Yocam & Wilmore, 1994) sought to create a context for teacher development in the area of technology integration. Report #17, creating an Alternative Context for Teacher Development: ACOT’s Two-Year Pilot Project (Yocam & Wilmore, 1994), and Report #18, Creating an Alternative Context for Teacher Development: The ACOT Teacher Development Centers’ (Ringstaff & Yocam, 1994) report on effective aspects of providing opportunities for teacher development in the context of technology integration. Report #17 researched the effects of technology staff development. The plan included assigning two teachers from a school to spend three days observing an experienced ACOT teacher and discussing ways to integrate technology in their own classrooms. Each teacher had hands-on experiences with technology, reviewed educational software programs, discussed instructional uses of technology and developed a proposal for using a computer in an upcoming lesson in his/her own classroom. After being trained, the teachers borrowed one Apple IIe computer and software and used the computer in their classrooms the following year. The teachers received follow up support throughout the year via an ACOT coordinator and submitted a written report at the end of the year describing their experience. Principals also submitted a written report describing

how the trained teachers integrated technology within their classroom. This report concluded that teachers who participated in the staff development showed increased classroom computer use, increased number of different kinds of software applications employed by students and teachers, increased professional efficacy, increased sense of personal success, and decreased computer anxiety. The report also provided the following principles for technology staff development: (1) situated learning, (2) learning by doing, (3) technology-rich environments, (4) specific plans for change, (5) peer support and information dissemination, (6) ongoing assistance and time for reflection, and (7) continued access to technology. The report ended by stating, "without the technical, organizational, and social support described, however, teachers rarely use the technology for more than traditional drill and practice…. Further, without systemic support, the work of a few, no matter how committed, has little chance of significantly reforming the process and outcomes of schooling" (p. 10).

The ACOT reports looked at how computer technology was integrated into the school environment, which could be seen as a diffusion of innovation process. The elements of diffusion tie into the area of technology access that is critical in order for teachers not to be inhibited to use technology (Abbot, 2003; Becker, 2000; Carlson, 2002; O'Dwyer et al., 2004). With over half of all teachers not routinely using technology (Abbot, 2003) and only 20% feeling they are prepared to use technology (CEO Forum, 1998), observability of technology integration is difficult. Teachers' teaching philosophies determine the compatibility of integrating computer technology into their classrooms and the ways in which they will integrate. Dwyer et al. (1990) in the ACOT study indicated that as teachers progress in their technology integration, their teaching

styles move to more constructivist philosophies of teaching and learning. As teachers become more comfortable with integrating technology, their style of teaching often changes, making technology integration and teaching philosophy more compatible. The last two areas of complexity and triability can be accomplished by offering both workshops that allow teachers to learn new programs and classroom technology support via coaching that allows teachers to experience integrating technology with students in their own classroom.

Given the documented need for on-going technology support in order to aid the development of teachers in the area of technology integration, one must examine what this support would look like. Hofer, Chamberlin, and Scot. (2004) explain how technology integration specialists can act as change agents aiding curriculum and pedagogy renewal. They can help teachers see how technology can be imbedded within the curriculum and not treated as a separate subject area. Dexter, Seashore, and Anderson. (2003) examined technology support in nine schools to evaluate what characteristics were present with quality technology support. They selected these nine schools from over 110 schools in 86 school districts through a nationwide solicitation for schools via state technology directors in all fifty states. Qualitative data were collected via interviews and site visits. They found that technology specialists were important in providing both support and subtle pressure for change. This finding supports Rogers' (1995) explanation of how change agents can be used to influence a system to change. The technology support personnel "supported teacher and organizational learning and thereby exerted considerable influence on how technology was incorporated into the substantive core of teaching and learning at these school sites" (Dexter et al., 2003, p. 3).

All of the schools involved in the study had high access to computers from a minimum of 1:5 student/computer ratio in some schools to a 1:1 student/computer ratio in two of the schools. Additionally, all schools had multiple technology resources for teachers to use during instruction including some sort of large screen display, digital cameras, scanners, and printers that were well networked making file sharing easy. Four of the schools had full time school specific technology instruction specialists, two schools had computer class teachers who worked with colleagues to plan their units of instruction that they delivered to students, and the remaining schools had technology support staff who operated from the district level. They found that district models had a tendency to use "whole group models" of instruction, while the school based models tended to use a "one-to-one model" of instruction in which the technology support personnel met with individual teachers to offer support and meet individual teacher's technology learning and integrating needs. Some findings of the study are: (a) teachers have to observe technology integration in action, (b) people must have their technology needs met at their individual technology level, and (c) the main emphasis needs to be on the curriculum and not the technology. The importance of (a) direct instruction on how to use software, (b) integration support personnel, and (c) a coaching model was emphasized by one of the participating middle schools. Findings concluded that technology support positively impacted teachers' own uses of technology and their classroom technology integration.

Using Mentoring and Peer Coaching to Support Teachers with Technology Integration

Teacher technology support is essential in creating a teaching and learning environment rich in technology integration (Dexter et al., 2003; Hofer, 2004). Ronnkvist et al. (2000) examined Teaching, Learning and Computing: 1998 A National Survey of

Schools and Teachers (TLC) data for the presence of support available to teachers and found that technology coordinators in the TLC study reported less than one hour per week was dedicated to helping teachers write lesson plans allowing them to integrate technology. Ronnkvist et al. (2000) also referenced a 1999 *Education Week* survey by Jerald and Orlosfsky that indicates two-thirds of American schools do not have a full-time technology coordinator. Given these current limitations on technology support, examining the positive effects of mentoring and peer coaching in relationship to technology integration is warranted.

Mentoring and peer coaching are two terms that different people define in different ways, complicated by the fact that many writers use the terms interchangeably. Bareen, et al. (2000) traced mentoring back to early apprenticeship models of learning a craft. A mentor is defined as someone who has more experience in an area who works with a novice in order to refine the novice's skills. This article emphasizes that current mentoring practices are not for the novice to be exactly like the veteran, but for both to reflect on their individual teaching styles while the novice learns new skills to enhance his/her teaching. Peer coaching is defined by Robbins (1991) as "a confidential process through which two or more professional colleagues work together to reflect on current practices; expand, refine, and build new skills; share ideas; teach one another; conduct classroom research; or solve problems in the workplace" (ASCD website). This definition matches the descriptions Showers and Joyce (1996) provide in their article on peer coaching. With over a decade of research on peer coaching, Showers and Joyce (1996) recommend the following principles for peer coaching (a) all faculty in a school must agree to be a member of a peer coaching team, (b) verbal feedback should be

omitted as a coaching component and emphasis should be put on planning and developing curriculum and instruction in pursuit of shared goals, (c) peer coaching is made up of a coach or the one doing the teaching and the coached or the one observing in order to obtain new ideas, and (d) teacher learning takes place via collaboration when planning instruction, developing support materials, and the thinking together of the impact of their behavior on student learning. Both of these definitions of peer coaching and mentoring stress the importance of reflective practice and sharing with others in the professional development growth process.

The ACOT findings on teacher development in relationship to technology integration parallel the research of Showers and Joyce on using peer coaching to empower teachers to develop their skills in new curriculum areas. Further, Thurlow (1999) recommends the Showers and Joyce model of peer coaching as a way to increase technology integration and teacher development in schools. Coaching relationships allow individual teachers to have their learning needs met at their level, much like a teacher would differentiate instruction for his/her students. Thurlow believes peer coaching is positive because teachers have close working relationships with school based building colleagues, these relationships extend beyond the school day and can facilitate needs being met after school hours, collaboration is encouraged and time is easier to dedicate towards building level in-services. Showers and Joyce (1996) found that teachers involved in peer coaching practiced new skills and strategies more frequently and applied them more appropriately than teachers who worked alone. Members of peer coaching teams also were more likely to use new strategies over a longer period of time. Thurlow (1999) believes seven elements need to be present for a technology mentoring

relationship model to work. First, released time during on-contract times or financial incentives during off-contract times must be present. Second, hardware and software must be available to teachers, including computers and software, loaned to teachers so they can practice skills at home. Third, financial incentives or awards should be given. Fourth, continuing education credits or certification endorsements should be granted. Fifth, hardware and software should be provided for teacher's classrooms so they can integrate what they learn. Sixth, technical support should be ongoing and accessible. And seventh, follow–up training and mentor support need to be on-going. Wiske (2005) states learning to integrate technology into teaching "depends on cycles of thinking about learning and teaching, analyzing key concepts and methods of inquiry within or across subject matters, trying out new practices, and analyzing those experiences with like-minded colleagues and coaches" (p. 116).

Peer coaching and mentoring can have positive effects on teacher technology integration, but at times can have negative consequences if teaching loads and responsibilities are not taken into consideration. Beattie (2000) discusses the implications of using teachers to train other teachers over and beyond their regular teaching loads and required extracurricular activities because this practice can easily lead to staff burnout. While schools are using already overloaded teachers to assist others with technology, corporations are hiring technology support personnel on a standard of one personnel support person per every 50 computers.

Beattie suggests five reasons, beyond financial, why schools lack the proper technology support needed for technology integration. The five reasons are:

> Schools must compete with corporations for qualified personnel with the required technical skills needed to support technology integration.
> Qualified technology support personnel do not always have the appropriate personality to relate to people in a school setting.
> School administrators prefer to hire certified staff instead of classified staff because it reduces their student to teacher ratios.
> School administrators are often not aware of the demands on technology personnel and may not understand the need for hiring technology support personnel.
> The kind of technology support necessary for k-12 educational environments has yet to be defined. A new breed of technology professionals needs to be defined and developed (no page).

Gahala (n.d.) proposes that the ideal situation is for all schools to have a site based technology specialist. Gahala emphasizes the need for teachers to have quick responses to technology problems, assistance with technology, and appropriate staff development. An onsite specialist could provide all of these services. A site based technology specialist can capitalize on the positive effects of peer coaching using the guideline set forth by Showers and Joyce, while also avoiding the burn out cited by Beattie. The state of Georgia currently provides school systems one teacher base salary for every 1,100 Full Time Equivalent (FTE) “to hire educational technology staff” (The State of Georgia k-12 Technology Plan, n.d., p.33). Unfortunately, this money has few guidelines on how it can be spent. Given the size of most metropolitan schools in Georgia, this staffing allotment would mean that each metropolitan school could have a minimum of a half-time teacher dedicated to technology integration.

Summary

Previous research addresses effective teacher development in the area of technology integration, the positive effects of on-going support during teacher

development, and how the presence of elements of diffusion impact the adoption of new technology. Research is also available on the benefits of peer coaching and mentoring. However, studies are not available on how the factors of elements of diffusion, teacher development, and support interact to promote teacher technology integration within classrooms. Also, previous research does not focus on how one of these aspects, in isolation, without attention to the other aspects may inhibit teacher technology integration within classrooms. While research provides a knowledge base of elements which inhibit or promote technology integration, it does not provided information on how the presence or absence of these elements interact to impact teacher technology integration. Knowing how these factors relate can add to the body of research and assist educators in planning for more rapid diffusion of new ideas that impact student learning by providing a model to follow when planning for technology related staff development. Given the length of time technology has been present in schools and the lack of wide spread teacher technology integration, research in this area could have a significant impact on change within educational settings.

CHAPTER 3

METHODOLOGY

Introduction

A mixed methods approach using a triangulation design with a convergence model of data interpretation was used for this study. The study was designed in a pragmatic paradigm with a phenomenological qualitative approach. A triangulation design is a single phase mixed methods approach in which quantitative and qualitative data are both used to answer the research questions. Analyzing data in a convergence model involves analysis of quantitative and qualitative data separately with the convergence of the findings at the end of the study. The phenomenological approach to qualitative data analysis is concerned with participants' experiences with a common phenomenon with coding of data for themes. The study examined teachers' experiences with support, experiences with staff development, and the presence of elements of diffusion within their schools. Data analysis paid close attention to how access to support, staff development and the presence of elements of diffusion impact teachers' classroom technology integration. The following questions guide this research:

1. How do teachers experience the five elements of diffusion (complexity, triability, observability, relative advantage, and

compatibility) in the area of technology integration in elementary schools?

2. How do teachers experience instructional technology support and the impact of support on their technology integration instruction?
3. How do teachers experience technology staff development and the impact of staff development on their classroom technology integration?

Choosing the method

A mixed methods approach to research was appropriate for this study in order to gain a deeper understanding of the dynamics of teacher classroom technology integration in relationship to teachers' experiences with support and staff development and appearance of elements of diffusion within elementary school contexts. Elements of diffusion are part of a larger theoretical framework of Systems theory in which the whole of the system is more than the sum of its parts (Rogers, 1995).

Quantitative methodology for this study consisted of frequencies, percentages and correlations in order to provide basic information on demographics, and interrelatedness of variables. Qualitative methods included a phenomenological approach to data analysis of open-ended responses, oral interviews, reflection journals, and work samples to examine common themes present in teachers' experiences with the technology teacher development initiative.

This study used a pragmatic paradigm. According to Creswell (2007), researchers using this paradigm "will employ both quantitative and qualitative sources of data collection, will focus on the practical implications of the research, and will emphasize the

importance of conducting research that best addresses the research problem" (p. 23). The practical implications of this research are in the formation of effective technology staff development programs and elementary school environments which promote teacher technology integration. A phenomenological approach best matched the qualitative goals of this study. In this approach the researcher selects a phenomenon that is experienced by multiple subjects to study (Creswell, 2007). In this study, the subjects were elementary teachers and the experienced phenomenon was technology related staff development, the availability or lack of availability of technology related support within the school context, and the elementary school environment as it related to technology. Using phenomenology, the researcher makes interpretations from data collected from participants. Data analysis was done by examining the data sources for significant statements or quotations and then combining these into themes. The themes were clustered for meaning. Multiple sources of data were examined including interviews, journals, and open-ended survey responses. Five to 25 participants are recommended for interview purposes in a phenomenological approach (Cresswell, 2007). This study consisted of 16 teacher interviews and one program director interview. Themes were used to write a description of the participants' experiences, the setting of the experiences, and a description of the essence of the overall experience. This approach was appropriate for this study because of the common experience in a technology staff development program of the participants, the use of multiple sources of data including participants' staff development web pages (which include projects and web logs), surveys, and interviews. Additionally, a triangulation design was adopted as a mixed methods approach to data analysis in which both quantitative and qualitative data were collected concurrently in a

single phase to answer the research questions. Quantitative and qualitative data were examined separately and then converged during interpretation of results in line with a convergence model of triangulation design suggested by Creswell (2006).

Overview of Research Design

A triangulated mixed methods approach drew upon the following data: (a) online survey of 81 teachers with quantitative and qualitative questions, (b) interviews with 16 purposely chosen teacher, 15 of whom filled out the survey, (c) first year web logs from the 16 interviewed teachers, and (d) an interview with the project director. All of these data sources were used to examine teachers' experiences of support, professional learning opportunities, the presence of elements of diffusion, and the impact these have on teachers' classroom technology integration. Because of the triangulated design of the study, correlations and frequencies/percentages were chosen as quantitative approaches to data analysis. Using correlations as part of data analysis deals with examining relationships among variables and the extent to which those relationships exist (Huck, 2000). This method of data analysis and presentation was appropriate for this study because of the desire of the researcher to examine relationships among experiences with support, professional development opportunities, and the presence of elements of diffusion, and to examine how these shape teacher technology integration. Descriptive statistics, summarization of single dependent variables, were used to create a picture of teacher demographics, staff development ratings, access to support, frequency of personal and classroom computer use, and presence of elements of diffusion. Qualitative analysis accounted for a large part of data analysis in this study. Qualitative data sources were analyzed using matching of themes (Creswell, 2007). Multiple data sources were

examined for recurring themes within and across data sources from individual participants and the whole of participants. According to Shadish et al. (2002), qualitative research has a strength in "the discovery of new hypotheses, and the description of how treatment interventions are implemented or of possible causal explanations" (p. 478). These traits of qualitative research fit this study because of the exploratory nature of the study and desire of the researcher to unveil improved ways of teacher development in relationship to technology integration.

The researcher created her own data collection instruments after examining multiple technology integration instruments including *Beliefs About Teaching with Technology* (Lumpe & Chambers, 2001) and multiple instruments from the Institute for the Integration of Technology into Teaching and Learning (IITTL) at the University of North Texas (IITTL, n.d.). Because of the limited data which these already available instruments could produce specifically on teachers' exposure to elements of diffusion, technology staff development experiences, and on-going support experiences, the researcher developed her own survey instrument. The quantitative survey instrument was piloted with 15 teachers to check for question clarity and response time in completing the full survey. The teachers who filled out the pilot survey commented that the questions were clear and that the survey should take about 15 minutes to complete. One misspelling was found by multiple people who piloted the study and two questions needed to be changed from a yes or no answer to a scaled response. Qualitative data were collected via open ended responses on the online survey, teacher interviews, and teacher web logs. Open ended survey questions and interview questions were read by others to check for clarity.

Research Context

The subjects in this study were teachers from a suburban, southeastern metropolitan school district who voluntarily applied to participate in a two year district technology staff development initiative in which they received training as well as an interactive white board, ceiling mounted LCD projector, and student response devices to be used with the interactive white boards in their classroom. The participants were completing the first year of this two year initiative which spanned the 2006-2007 school year and 2007-2008 school year. Another round of teachers were participating in the same two year initiative in the 2007-2008 and 2008-2009 school years. The application for participation in the initiative included explanations of how the applicant was currently using technology in the classroom. Participants were likely to be early adopters of technology since they pursued the chance to participate in the initiative. Local schools decided on who within their school would participate in the initiative and the district accepted all school based recommendations. Because of the local decision-making, the percentage of teachers participating in each school was not equal. However, the participants were fairly equally represented across grade levels across all participating schools. One of the 20 possible elementary schools did not have any teachers apply for participation in the initiative.

Participants in the technology initiative agreed to a two year staff development process which involved both online and traditional classes, a reflective on-online portfolio, and development and use of technology lessons and projects for their classroom. They were currently at the end of the first year of a two year commitment at

the time of this study. At the end of the two years they will receive a county technology endorsement.

Two hundred fifty-nine kindergarten through twelfth grade teachers participated in the teacher development initiative. Elementary teacher participants totaled 131 teachers. Grade level demographics consisted of: 19 kindergarten teachers, 13 first grade teachers, 17 second grade teachers, 17 third grade teachers, 13 fourth grade teachers, 16 fifth grade teachers, 20 sixth grade teachers, 6 gifted and talented teachers, 6 special education teachers, and 4 teachers of other subjects. Subjects were solicited from the elementary school teacher participants via e-mail asking participants to respond to an online survey. Eighty-one elementary teacher participants voluntarily responded to the online teacher survey. Interview participants were selected from eight schools purposefully chosen to represent the diversity of the schools within the district. Two teachers from each of these eight schools were purposefully selected by grade level or subject area taught and whether they were serving as a mentor to other teachers within their school. The eight schools include one school which did not meet Annual Yearly Progress criteria as spelled out by No Child Left Behind, two Title 1 schools, the largest elementary school in the district, two of the smallest elementary schools in the district, an elementary school with a high percentage of Early Intervention Prevention students, an elementary school with a high percentage of special education students, and a Platinum Award winning school. The elementary schools ranged in size from 278 students to 1,542 students. Special education populations ranged from 10.3% to 14.8% of the student population. The English as a second language learners populations ranged from zero percent to 16.3% of the student populations. Early Intervention Program populations

ranged from 11% to 31.7% of the student populations. Also, each school was served by a different technology specialist who is assigned to technology hardware, software, and network maintenance and all but two of the schools were served by different Instructional Technology Specialists who were involved in teacher development and instructional support. Teacher participants worked in a rapidly growing suburban school district in one of the fastest growing counties in the nation. The estimated 2005 Census Bureau population for the county was 184,211, a growth of over 40,000 since the 2000 Census. The 2004 per capita income was $30,590 and the 2005 unemployment rate was 3.6%. Around 2000 families within the county received food stamps per month during the 2005 fiscal year (GA DOE, n.d.).

The school district served over 33,000 students in 36 schools. Twenty of these schools were elementary schools, but they were not all configured to include the same grade levels. Eleven elementary schools served students kindergarten through 6th grade, six elementary schools served students kindergarten through 5th grade, and three elementary schools served students kindergarten through 4th grade. Nineteen of the twenty elementary schools participated in the technology staff development initiative during the 2006-2007 school year, the first year of the initiative. The overall student population for the district in 2006 was 21% economically disadvantaged, 12% students with disabilities, and 4% English Language Learners. Students in the district were ethnically represented as follows: white 81%, Hispanic 10%, black 6%, multiracial 2%, and Asian 2%.

In 2005-2006, school system employment consisted of: 116 full-time administrators and four part time administrators, 171 full-time and 21 part-time support

personnel positions, and 2,143 full-time and 146 part-time pre-kindergarten through 12th grade teachers. Of this total, 1,889 teachers were female and 400 teachers were male. Teachers represented all degree levels with 1,038 having only a bachelor's, 902 a master's, 323 a specialist's, and 17 a doctoral degree. The majority of the teachers, 2,246 were white. Teachers in other ethnic categories were: 16 black, 20 Hispanic, 4 Asian, and 3 Native American. Teachers in the district also represented a wide range of teaching experience. Teaching experience was listed as follows: first year=143, 1-10 years = 965, 11-20 years = 667, 21-30 years = 445, and over 30 years, = 69. On average, teachers within the county had 12.85 years of teaching experience (GA DOE, n.d.).

Participants

Participants in this study consisted of 81 teachers who responded to an online survey using Survey Monkey and 16 teachers who participated in interviews and agreed to grant access to their web logs. In addition, the project director was interviewed.

Online Survey Participants

Survey Monkey participants were solicited via email with 81 of 123 teachers who received the email responding to the survey. In addition to the quantitative data collection on Survey Monkey, 71 responses were received for each of four open ended Survey Monkey questions leading to 284 open ended responses for qualitative coding. Female teachers consisted of 93.7% of the 79 participants who responded to the gender question on Survey Monkey and all sixteen oral interview participants. The majority of teachers participating in the online survey held a master's degree, 43%, with 29.1% holding a specialist degree, and 37.9% a bachelor's degree. Two of 79 respondents reported working part time. Over half of participants, 67.9% (55 of 81), reported having

participated in the InTech technology staff development initiative; 46.8% (37 of 79) reported having an undergraduate course focused on technology integration; and 46.1% (35 of 76) reported having a graduate course focused on technology integration. Participants represented a variety of ages with roughly 14% under 30 and slightly over 20% over 50 years of age. Teaching experience was also varied among participants with almost 18% with 5 or less years of teaching experience and 17.5% with more than 20 years teaching experience. Participants also represented all k-6 grade levels, special education, gifted education, and other teaching responsibilities. The majority of respondents were kindergarten teachers with 6th grade teachers being the second largest group of respondents. The following tables show teachers' ages, years of teaching, and grade level they were teaching at the time of data collection

Table 2

Participant Ages

Age	*Percentage of Respondents*
21-24	0%
25-29	13.9% (11)
30-34	15.2% (12)
35-39	24.1% (19)
40-44	13.9% (11)
45-49	12.7% (10)
50-54	8.9% (7)
55-60	11.4% (9)
60+	0%

Table 3

Participant Teaching Experience

Years Taught	*Percentage of Respondents*
1-3	11.3% (9)
4-5	6.3% (5)
5-10	27.5% (22)
10-15	26.3% (21)
15-20	11.3% (9)
20-25	15% (12)
25-30	2.5% (2)

Table 4

Participants Teaching Level

Grade Level	*Percentage of Respondents*
Kindergarten	20.3%
First	10.1%
Second	15.2%
Third	13.9%
Fourth	7.6%
Fifth	8.9%
Sixth	17.7%
Gifted	3.8%
Special Education	7.6%
Other	3.8%

Oral Interview and Web log Participants

Oral interview and web log participants were solicited from elementary teachers participating in the program. All teachers kept a web log throughout their experience and the researcher examined the web logs of oral interview participants for further triangulation of data. Sixteen teachers participated in oral interviews and agreed to have their web logs analyzed. The oral interview participants were all female and ranged in age from 25-60. They had varied degree levels with 5 holding a bachelors, 7 a masters, and 3 a specialist degree. Grade level taught also varied with (a) one teacher in each

grade of kindergarten, fourth, sixth, first/second combination, and computer lab; (b) two gifted teachers; (c) two fifth grade teachers; and (d) three teachers each in both second and third grades. Teachers also had a wide range of teaching experience with two teachers having less than three years experience, five between five and ten years experience, four with 10-15 years experience, three with 15-20 years experience, and one with over 25 years of experience. Four interviewees were from Title 1 schools. Demographic information was not available for one interviewee because she did not complete the online survey.

Intervention

The intervention studied was a school system driven technology staff development initiative. District employees designed and implemented all aspects of the initiative. The initiative was a two year technology staff development program in which teachers receive a district level technology integration endorsement and $400 stipend upon completion. The initiative started with the fall semester of 2006 and was superintendent supported. Many levels of administration worked to make it successful. Teachers took a variety of courses both in traditional lab environments and online, implemented what they were learning in their current classroom, reflected on their practice in web logs, and had the support of district instructional technology personnel. Teacher participants in the study were completing the first year of the two year staff development initiative. During fall 2006, the first semester of the program, teachers attended an orientation meeting where an overview of the program and expectations were outlined, responded to the LoTi assessment tool which provides information on teacher's technology ability and current levels of technology integration, responded to articles on

technology integration, wrote weekly web log entries in their online professional development portfolio reflective journal, and attended one course entitled Engaged Learning in [name of district] District Schools. The required first semester course focused on changing needs of the 21st century, engaged learning, and levels of technology proficiency, integration, and implementation in order to achieve engaged learning. Participants in the class learned to recognize indicators of engaged learning and assess their own practice regarding this concept. The table below outlines the requirements and electives for teachers as part of this district level endorsement.

Table 5

School System Technology Staff Development Requirements

Year	Semester 1	Semester 2
Year 1	Required Components: Orientation Meeting LoTi Pre Assessment Current Article Reflections and Responses Engaged Learning in District Schools Weekly Web log Entry Elective Components: Portfolio Management Elective Courses Elective Projects	Required Components: Current Article Reflection and Response Using Electronic Whiteboards to Engage 21st Century Learners I Internet Safety (Online) Weekly Web log Entry 4 Whiteboard Flipcharts used with students Elective Components: Elective Courses Elective Projects Pre-approval for Technology Capstone Integration Project
Year 2	Required Components: Using Electronic Whiteboards to Engage 21st Century Learners II 7 Whiteboard Flipcharts used with Students Current Article Reflection and Response Implement Capstone Technology Integration Project Elective Components: Elective Courses	Required Components: LoTi Post Assessment Current Article Reflection and Response 4 Electronic Whiteboard Flipcharts used with Students District Review of Capstone Technology Integration Project Elective Components: Elective Courses Elective Projects

During the second semester, participants attended a required course on either Promethean or Smart Board technologies in which they learned the basics of using one of these two interactive white board platforms according to which technology was in their classroom setting. In addition they participated in reflections on technology integration

articles, participated in an online course on internet safety, made weekly web log entries on their professional development web page, and created four whiteboard flipcharts to be used with students. The teachers also had to submit their proposal for an action research project or standards based curriculum project to be conducted during year two of the initiative. Teachers had opportunities to participate in elective courses and/or projects in order to accumulate credit towards the 200 points necessary to complete the program. Points were assigned to tasks ranging from 1 point for completing the LoTi survey to 10 points for completing a 10 hour class. The proposal forms, course offerings, and elective project options can be found in the appendix section in Appendixes C, D, & E.

Program Development

Program development information was obtained from the program director interview. The staff development program was designed by the school system over a period of a year by various school stake holders. A technology advisory committee of stake holders consisting of school district leaders at the district and local school level, teachers, media specialists, students, parents, local area university faculty, and local business leaders had input in designing a program to meet the needs of 21st century learners. The foundation of the program was laid utilizing roundtable discussions with 83 participants answering three questions. The three questions were: (a) How can technology enhance k-12 education? (b) What technology would you most like to see in our schools in the next five years? and (c) What will it take to get there? The Instructional Technology Department took this feedback, summarized the findings and presented the findings to the board of education along with ideas for their three year technology plan. During this presentation to the school board, the instructional technology staff also

demonstrated various technologies which could be integrated into classrooms. The school board and superintendent were supportive of the various technologies. In addition to a plan on how technology was going to be placed in classrooms, the superintendent wanted a plan on how teachers would be supported throughout the program so they could effectively use the new classroom technology. As a result, the Supervisor of Instructional Technology for the school system brainstormed possibilities and met with a committee to fine tune the program to prepare it for implementation. Elements of the program were shaped by examining what other schools and districts were doing in terms of technology integration, graduate course work of the Supervisor of Instructional Technology, and knowledge of what had and had not worked in the past in regarding technology in the school system. Staff development was a critical focal point for the staff development plan. When asked about other programs that could have been used as a model, the reply was; “We didn’t find any (other programs) that would exactly fit and I’m not sure you ever would, but I don’t think we found any that had the tie between the equipment and the support, the professional development.” (program director interview) Given that there was not a strong technology staff development model including both (a) a plan for technology equipment placement and maintenance and (b) staff development which included both training and ongoing teacher support for schools to follow, the school system developed its own plan to meet the needs of their teachers and students. The program consisted of courses on software and/or hardware, a course on 21st century learners, projects where teachers implemented what they learned in their classroom, web log entries, and a capstone project. In addition, support was readily available to all participants via school based mentors, course instructors, instructional technologists, and

hardware/software technical support staff. In this study, these various layers of support are referred to as support staff or personnel support. Data for this study were collected at the end of the first year of program implementation. Teachers participating in this study were half-way through their two year staff development commitment in which they will receive a district based technology endorsement.

The program was designed with a primary focus of engaging today's students and equipping teachers with the skills to succeed in this task. Two quotations from the program director interview illustrate this principle.

> [program name] is really geared around teaching our students to be thinkers, to be creators, to be producers, to look outside their classrooms, to go global if possible. So in stretching our own thinking, it has also made us think about the end product of where are our students going and can using technology help us get there?
>
> It really wasn't designed around one piece of equipment. It really wasn't designed around a class that we wanted everybody to have. It is how can we best meet the needs of 21st century learners and the technology was just the piece that fit the bill for us.

Data Sources

Quantitative Teacher Survey

Data relevant for this study included teacher demographics, personal use of technology, classroom instructional use of technology, staff development experiences, experiences with elements of diffusion, experiences with available support, and access to technology resources. The researcher designed a survey using research on elements of diffusion, staff development, and limitations on technology integration as a guide. Questions were designed to capture the experience of teachers with elements of diffusion and presence of support. Multiple questions address each of the five elements of diffusion and the presence of support. The majority of the questions on the survey were presented

in a five point Likert scale format in which the question was rated based on frequency of technology use or level of agreement/disagreement. Yes and no questions made up the second largest part of the survey in which teachers responded to the questions concerning technology hardware and or software, and access to support personnel within their classroom and/or school. Other questions in the survey consisted of demographic information such as age, degree level, years of teaching experience, etc. As mentioned earlier, the survey was piloted for clarity by teachers from another school system and a few changes in the survey were made based on their feedback. The survey data were used for descriptive statistics and correlations in order to gain insight into teachers' experiences with support and the presence of elements of diffusion in their schools. Timing of the study and the inclusion of multiple constructs precluded the analysis of test-retest or internal consistency reliability of the survey. However, the calculation of correlations allowed for initial examination of consistency of response. See Appendix G for a copy of the survey.

Open Ended Teacher Survey

The survey consisted of open-ended questions requiring a written reflection on staff development experiences, access to technology, access to instructional technology support, and the presence of elements of diffusion within the teacher's school and district. The survey questions were embedded in the online survey along with the quantitative questions. Data were coded qualitatively to gain insight into teachers' experience with the presence of elements of diffusion within their school, available support, and helpful elements of staff development programs. See Appendix G for the survey questions.

Teachers' Staff Development Web Pages

Teacher participants in the initiative kept a weekly web log of their experiences. Teachers began these reflection web logs in October of 2006 towards the beginning of the initiative. The staff development web pages of 16 teachers participating in the oral interviews, including all entries for the first year of the initiative, were selected for in-depth study. The first year web logs, were examined for recurring themes which provided insight into teachers' experiences with available support and presence of elements of diffusion. In addition to the web logs, teachers posted projects and flip charts on their web pages. Flip charts are used with the Promethean brand of interactive white board and are designed for instructional purposes. Projects consisted of a variety of work samples utilizing software learned in staff development classes. The original intent was to examine these artifacts but at the time of data collection all projects, particularly the teachers' complete capstone projects were not posted. At the time of data collection, teachers and county technology staff were fine tuning these projects for approval for implementation the following school year. In addition, the artifacts themselves did not address the research questions for this particular study because they contained a sample of the project often without descriptions and explanations of whether the project was teacher or student created. However, The web log entries provided insight into how the staff development program was impacting teachers and their classroom instruction and were therefore analyzed in this research.

Teacher Interviews

Oral interviews were conducted with a purposefully selected subset of 16 teachers. These teachers were selected in order to represent a variety of grade levels or

subjects taught and for mentor status. Eight schools were chosen to represent the diversity of schools within the school system and two teachers were selected from each school and asked to participate in an oral interview about their experiences during this initiative. All 16 teachers agreed to participate in an oral interview. Some of the teacher interviewees had served in the role of mentor to other participants within the program. Interviews were done individually and took 20-50 minutes. Interviews were audio recorded, transcribed and coded for reoccurring themes. See Appendix G for questions.

Project Director Interview

An oral interview with the project director was conducted to gather information from an administrator's perspective on how this initiative was working compared to other technology staff development initiatives and how the school system decided on the format of the initiative. The interview was audio recorded and transcribed. Data were coded qualitatively to gain insight into how the director's perceptions of the program compared with teachers. See Appendix H for interview questions.

Administration of Data Sources

The quantitative and open ended teacher surveys were placed on an online data collection tool, Survey Monkey, and the elementary teacher participants in the program were e-mailed the link with a request for their participation in the study including the completion of the initial survey and permission to use their online web page. The e-mail message and the introduction to the online survey ensured participants their privacy indicating their names and related responses will not be shared with the district nor used in any publication. They were assured anonymity. The online reflections, web logs, were accessed via the school system's web site at the end of the 2006-2007 school year and copied and pasted into a word document for coding. Teacher interviews were conducted the last two weeks of the 2006-2007 school year. The project director

was interviewed in July of 2007. Institutional Research Board (IRB) consent forms used in this study can be found in Appendix I.

Analysis of Data

Data were analyzed to answer the three research questions presented at the beginning of the chapter with quantitative and qualitative data analyzed separately to answer each question and then converged during interpretation. Quantitative data were analyzed in the form of descriptive statistics (frequencies and percentages by response category) and correlations using SPSS. Quantitative data were collected via the online survey tool Survey Monkey. These data were downloaded from Survey Monkey as a comma delineated file and uploaded into SPSS for data analysis. The first table in each section indicates item frequencies and the other tables in each section show correlations. A two tailed Pearson Correlation analysis was computed resulting in correlation tables that showed how individual questions from the survey correlated with one another. Often correlations are presented in correlation matrixes; but this study resulted in a large number of correlations, making it difficult to place all correlated items in a matrix. Due to the large number of correlations and the desire to make data as accessible as possible for readers to understand, a decision was made to place the correlations in a table format. Each survey item is presented in a separate table with the other survey items with which it significantly correlates. Correlations are presented with the highest positive correlation first and the highest negative correlation last. A positive correlation indicates both items are rated in the same manner. For example, two items in which both item responses receive a high percentage of strongly agree answers would be correlated positively. A negative correlation indicates two items were rated in opposite directions.

All qualitative data were examined by the forming of clusters of meaning or themes. This was done according to Creswell's (2007) explanation of data analysis using a phenomological design in which researchers examine the data for "'significant statements,' sentences, or quotes that provide an understanding of how the participants experienced the phenomenon" (p.61). This process is referred to as horizonalization (Moustakas, 1994 as cited in Creswell, 2007), in which all significant statements are listed and provided equal value for analysis. Significant statements were found and clustered into themes. All documents were coded with key words. Start codes related to elements of diffusion and support were utilized and other codes were developed as themes emerged from the data. All documents were read and significant statements were highlighted. These significant statements were electronically copied and pasted or typed into a document listing each significant statement with a reference to the document from which it was retrieved. Once all significant statements were retrieved from all documents analyzed, statements were categorized into clusters of meaning or themes.

Qualitative data were collected via open-ended questions on the online survey tool, teacher interviews, teacher web logs, and an interview with the director of the program. These data sources were coded for statements about: (a) support, (b) time, (c) access, (d) observability, (e) engagement and/or enjoyment, (f) change in teacher thinking or teaching, (g) triability, (h) relative advantage and/or compatibility, (i) complexity, (j) frustrations/concerns, (k) choice and (l) special student needs and/or special education. The majority of these codes were created prior to the beginning of data analysis. The last three codes of choice, frustrations, and special student needs and/or special education emerged from analysis of the data. The code of choice is presented under the umbrella of

relative advantage and/or enjoyment under question one. Many respondents reported that the ability to choose which classes they took was a strength of the program, which in turn allows them to match their learning to their needs raising compatibility and relative advantage. Frustrations and concerns are listed according to the question and theme in which the frustration was expressed. The code of special student needs and/or special education was something that appeared in the interviews with the reporting of engagement among active and special education students. This also falls under the relative advantage/compatibility umbrella because increased student engagement makes strategies more advantages to teachers. Once data were labeled according to these codes, data were clustered into categories to illustrate the various ways qualitative data provided answers to each of the research questions. Initial codes and clustered categories of coded data are explained in the qualitative section of each research question because they are research question specific.

Once quantitative and qualitative data sources were analyzed as separate methods of analysis, data were combined to examine how both data analyses informed the research as a combined data set. Research findings were examined for similarities and differences between the quantitative and qualitative analysis in order to better understand how teachers experience elements of diffusion, support, and staff development and how these experiences shape their technology integration within their classroom.

The table on the next page shows how data were analyzed to answer each of the research questions.

Table 6

Research Methods and Data Sources Used to Answer Research Questions

Question	*Data Source*	*Research Methods*	*Possible Evidence of…*
One Elements of diffusion	Online Survey	Descriptive Statistics Correlations Theme Coding of Open Ended Questions	Extent of presence of traits in schools Connection between presence of traits and integration
	Oral Interviews Web Log Reflections	Coding of Themes	Relationship between presence of traits and integration
Two Support	Online Survey	Descriptive Statistics Correlations Theme Coding of Open Ended Questions	Extent of presence of support in schools Connection between presence of support and integration Teachers' experiences with support
	Oral Interviews Web Log Reflections	Coding of Themes	Relationship between presence of support and integration Teachers' experiences with support
Three Staff Development	Online Survey	Descriptive Statistics Correlations Theme Coding of Open Ended Questions	Frequency of technology integration Types of technology integration Teachers' experiences with staff development
	Oral Interviews Web Log Reflections	Coding of Themes	Teachers' experiences with staff development How staff development impacts integration

Summary

This dissertation study consisted of mixed methods analysis of a school system technology staff development initiative in a large southern metropolitan area. Descriptive

statistics, correlations, and qualitative coding were used to answer research questions about experiences with elements of diffusion, support, and staff development and the impact this had on teacher technology integration within their classroom. Qualitative coding involved open ended responses to an online survey, teacher interviews, teacher web logs, and an interview with the project director. Qualitative data was coded and clustered for meaning in order to gain insight into the program in order to answer the research questions.

CHAPTER 4

RESULTS

This study used a triangulated mixed methods approach to examine teachers' experiences of support, professional learning opportunities, and the presence of elements of diffusion and to examine how these factors impacted teachers' classroom technology integration. A mixed methods approach was utilized in order to gain an in-depth understanding of various factors that can affect teacher technology integration while teachers are participating in a technology focused staff development initiative. Results from closed and open ended questions administered via the online survey tool Survey Monkey, teacher interview data, teacher web log data, and a program director interview will be presented in this chapter.

Triangulated data were utilized to answer the following questions:

1. How do teachers experience the five elements of diffusion (relative advantage, compatibility, complexity, triability, and observability) in the area of technology integration in elementary schools?
2. How do teachers experience instructional technology support and the impact of support on their technology integration instruction?

3. How do teachers experience technology staff development and the impact of staff development on their classroom technology integration?

The framework of this chapter consists of the following: (a) an overview of adoption categories and technology availability and use; (b) a section dedicated to each question with data that informs answers to each question; (c) summaries of each question subsection; and (d) a final summary at the end of the chapter.

Participant Adoption Self-Categorization

Participants were asked to rate themselves according to Roger's (1995) adoption categories. They were given the name of the adoption category, a few word description of that category, and the percentage of the population which usually makes up that category. The innovator category, or those who are first in line to adopt a new technology, received the highest percentage with 44.3% of teacher participants claiming to be innovators. An additional 38% claimed to be early adopters of technology with 16.5% claiming to be in the early majority, and 1.3% in the late majority. These self reported categorizations appear to be high, given that 82.3% self reported to be innovators or early adopters and only 16% of the general population consists of these two categories of people. But given that these teachers volunteered to be a part of this technology initiative from a group of roughly 2,600 teachers within the school system, the self reported categorizations are in line with percentage of the total teacher population of the district. It would be expected that a high percentage of innovators would be first in line to sign up for a two year technology driven staff development initiative and laggards would avoid such an initiative. The table below shows the percentage of respondents that reported belonging

to each of the adopter categories and the percentage of the general population that each adopter category represents.

Table 7

Self Reported Adoption Categories

Adopter Category	*Percentage of Respondents*	*Percentage of General Population**
Innovator	44.3%	2.5%
Early Adopter	38%	13.5%
Early Majority	16.5%	34%
Late Majority	1.3%	34%
Laggards	0%	16%

*based on Rogers (1995)

Technology Availability and Use

Participants had many technology resources available for instructional use. Online survey participants indicated the majority of the computers were new, with 95% of respondents reporting that computers were less than two years old. In addition 96% of teachers reported having at least five computers in their classroom, 93% reported having access to a computer lab, and 67% reported access to a mobile laptop lab. Participants also reported using technology frequently with nearly 80% integrating technology daily. The following tables show the resources available and the percentage of respondents who had access to each resource.

Table 8

Quantity of Classroom Computers

# of computers	*Percentage of respondents*
6+	56.8%
5	39.5%
4	2.5%
1	1.2%

Table 9

Classroom Based Technology Resources

Technology	*Percentage of Respondents*
Teacher laptop	100% (80 of 80)
Internet	100% (80 of 80)
LCD projector	98.8% (79 of 80)
Interactive White Board	98.7% (78 of 79)
TV	97.5% (78 of 80)
Access to a computer lab	93.8% (75 of 80)
Access to a mobile laptop lab	67.1% (53 of 79)
VCR	58.8% (47 of 80)
Digital camera	56.3% (45 of 80)
DVD player	51.3% (41 of 80)

Table 10

Frequency of Technology Integration

Frequency	*Percentage of Respondents*
Daily	79.0%
Several times a week	17.3%
Once a week	1.2%
Once a month	0%
Several times a semester	1.2%

Table 11

Software Used by Students

Percentage of Teachers Using Program	*Programs (most common)*
Over 75%	Microsoft Word Microsoft PowerPoint Success Maker Accelerated Reader Internet
Over 50%	Microsoft Publisher Kidpix
Over 25%	Microsoft Excel Inspiration Kidspiration Timeliner Library Database
Over 10%	Microsoft Frontpage Accelerated Math

Question One:

How do Teachers Experience the Five Elements of Diffusion

(Relative Advantage, Compatibility, Complexity, Triability, and Observability)

in the Area of Technology Integration in Elementary Schools?

Relative Advantage and Compatibility Quantitative Analysis

Response frequencies to the statements on the online survey that deal with relative advantage and or compatibility are shown in Table 12. Relative advantage is the concept that utilizing a new innovation is better than not utilizing a new innovation (Rogers, 1995). Relative advantage can be thought of as the new way is better than the "old fashioned way" or how it has conventionally be done. In respect to this dissertation topic, relative advantage is the degree to which teachers believe integrating technology

improves their classroom instruction. If teachers believe this to be true then technology integration has a high relative advantage for them, if they believe it to be false, technology integration has a low relative advantage. Compatibility is the concept that the new innovation is “consistent with the existing values, past experiences, and needs of potential adopters” (Rogers, 1995, p. 15). Compatibility also deals with the social system involved. Teachers who value technology and have had previous positive experiences with technology integration are likely to have greater compatibility with adopting new technologies. In addition, because of the importance of the social system, teachers who work in schools where administration and other leaders value technology are likely to have greater compatibility with technology integration. Because relative advantage and compatibility issues can sometimes overlap in the school environment, the questions addressing these issues are presented together.

The majority of teachers, over 80%, either agreed or strongly agreed with the following: (a) they enjoyed the technology staff development offered , (b) they had access to the software and hardware taught in staff development, (c) non working technology is fixed quickly, (d) they had access to school based staff development, and (e) technology staff development matched their teaching philosophy. Over half, but less than two-thirds agreed or strongly agreed that technology ideas are frequently shared during school meetings and administrators demonstrate the use of technology when presenting to faculty. Responses dealing with access to time to plan and learn new skills were more widespread without a strong majority percentage on the disagree/strongly disagree or agree/strongly agree end of the spectrum. The majority of respondents disagreed or strongly disagreed that they felt they were taking a class on information they

already knew and that staff development was repetitive and did not offer opportunities to learn new programs.

Table 12

Relative Advantage and Compatibility Survey Item Frequencies

	N	*Strongly Disagree*	*Disagree*	*Undecided*	*Agree*	*Strongly Agree*
I enjoy technology related staff development.	78	0% (0)	1.3% (1)	2.6% (2)	28.2% (22)	67.9% (53)
I feel frustrated in technology related staff development because I feel I am taking a class on information I already know.	77	18.2% (14)	50.6% (39)	15.6% (12)	10.4% (8)	5.2% (4)
I feel technology related staff development is repetitive and does not offer opportunities to learn new programs.	79	24.1% (19)	63.3% (50)	5.1% (4)	3.8% (3)	3.8% (3)
I always have the software programs (KidPix, Word, etc) or hardware (scanner, digital camera, etc) which is taught in staff development courses readily available for my use in my school.	79	0% (0)	11.4% (9)	6.3% (5)	53.2% (42)	29.1% (23)
When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	79	2.5% (2)	6.3% (5)	2.5% (2)	57.0% (45)	31.6% (25)
In addition to county staff development opportunities, my school offers technology related staff development.	79	2.5% (2)	3.8% (3)	10.1% (8)	40.5% (32)	43.0% (34)
Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	79	6.3% (5)	16.5% (13)	12.7% (10)	46.8% (37)	17.7% (14)
The leaders (administrators, etc) demonstrate use of technology when presenting to the faculty at my school.	79	3.8% (3)	20.3% (16)	17.7% (14)	46.8% (37)	11.4% (9)
Technology integration is often part of local school staff development.	79	2.5% (2)	12.7% (10)	8.9% (7)	45.6% (36)	30.4% (24)
I have the time I need to plan technology integrated lessons.	79	20.3% (16)	36.7% (29)	11.4% (9)	26.6% (21)	5.1% (4)
I have the time I need to learn new technology skills.	79	7.6% (6)	31.6% (25)	22.8% (18)	32.9% (26)	5.1% (4)
I have resources in my school (web page, software help) which cut down on the time I need to plan technology integrated lessons.	79	1.3% (1)	12.7% (10)	24.1% (19)	51.9% (41)	10.1% (8)
Technology staff development that I participate in matches my teaching philosophy.	79	0 (0)	0 (0)	3.8% (3)	67.1% (53)	29.1% (23)

Table 13 shows the seven items that correlated with the statement *I enjoy technology related staff development,* with which 96.1% of the respondents agreed or strongly agreed. The three highest correlations to this statement are survey items that deal with the staff development experience being motivating and providing skills necessary for integrating technology within the classroom. Enjoying the staff development experience impacts teacher motivation to implement what is learned within one's classroom (question 3). The one negative correlation deals with a feeling of frustration because the class is not teaching the teacher something new, most likely indicating poor relative advantage for the teacher. A match between the teacher's philosophy and the staff development experience and the ability of the staff development to simplify technology also appear to lead to enjoyment of the staff development experience, signifying the importance of relative advantage, compatibility, and complexity. From a support perspective, knowing the names of technology support personnel correlates with enjoying staff development.

Table 13

Correlations with Enjoying Technology Staff Development

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I enjoy technology related staff development.	77	I feel technology related staff development motivates me to integrate technology in my classroom.	.671**	3
	77	District technology integration training I have participated in has been effective in motivating me to integrate technology.	.503**	3
	77	District technology integration I have participated in has been effective in teaching me skills needed to integrate technology.	.400**	3
	77	Technology staff development I participate in matches my teaching philosophy.	.270*	1
	77	Technology staff development I receive helps simplify technology integration for me.	.264*	1
	77	I know the names of the technology support people who serve my school.	.231*	2
	75	I feel frustrated in technology related staff development because I feel I am taking a class on information I already know.	-.269*	1

** .01 level, *.05 level (2-tailed)

Table 14 shows the five items that correlate with the statement *I feel frustrated in technology staff development because I feel I am taking a class on information I already know*, with which 68.8% of respondents disagreed or strongly disagreed. Four out of the five correlations are negative. In the area of support, there is a negative correlation between feeling that other grade level colleagues support each other with integration needs and ideas and a feeling of frustration because the class is on information already known. There is also a negative correlation with the impact on classroom instruction with a connection between frustration and enjoyment and motivation to integrate. It appears that the more frustrated staff development participants are, the less motivated they are to integrate technology within their classroom. Three correlations deal with elements of diffusion. The one positive correlation was with a similar item indicating a link between

frustration with taking a class on information already known and not having the opportunity to learn new programs. Negative correlations were found between feeling the staff development moves too fast and enjoying staff development and feeling the staff development is on information already known by the participant.

Table 14

Correlations with Frustration with Repetitiveness of Staff Development

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I feel frustrated in technology related staff development because I feel I am taking a class on information I already know.	76	I feel technology related staff development is repetitive and does not offer opportunities to learn new programs	.658**	1
	76	Other teachers on my grade level support me with technology integration needs and ideas.	-.229*	2
	76	I feel technology related staff development motivates me to integrate technology in my classroom	-.263*	3
	75	I enjoy technology related staff development.	-.269*	1
	75	I feel that technology related staff development often moves too fast for me to learn the skills which I need.	-.371**	1

** .01 level, *.05 level (2-tailed)

Table 15 shows the four negative and one positive correlation with the statement *I feel technology related staff development is repetitive and does not offer opportunities to learn new programs,* with which 87.4% of respondents disagreed or strongly disagreed. This strong level of disagreement indicates that this staff development program offers opportunities for teachers to learn new software and is not repetitive. This is a positive finding because the correlations indicate that repetitiveness of staff development and lack of opportunities to learn new programs have a negative impact on teacher motivation to integrate technology. Three correlations deal with elements of diffusion, with a positive correlation shown between frustration with taking a class on information already known and a feeling of not having opportunities to learn something new, indicating poor relative

advantage and/or compatibility. Negative correlations were found between having time to learn and try new technology and the feeling that staff development was repetitive and did not offer opportunities to learn something new. None of the correlations dealt with support.

Table 15

Correlations with Repetitive Staff Development

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I feel technology related staff development is repetitive and does not offer opportunities to learn new programs.	76	I feel frustrated in technology related staff development because I feel I am taking a class on information I already know.	.658**	1
	78	District technology integration training I have participated in has been effective in motivating me to integrate technology.	-.257*	3
	78	I have the time I need to learn new technology skills.	-.268*	1
	76	I have opportunities to try new technology in my school.	-.272*	1
	78	Technology staff development motivates me to integrate technology in my classroom	-.318**	3

** .01 level, *.05 level (2-tailed)

Table 16 shows the 21 items correlated with the statement *I always have the software programs or hardware which is taught in staff development courses readily available for use in my school,* with which 82.3% of the respondents agreed or strongly agreed. This item correlated positively with 17 items across all three research questions. The strongest correlation, with *technology staff development I participate in matches my teaching philosophy* probably indicates a good match between believing technology integration is important and having the tools to implement that integration. The eight positive correlations with elements of diffusion (question one) include statements dealing with relative advantage, compatibility, observability and suggest that diffusion is strongly related to having software and hardware available. Having the software and hardware

also relate positively to feelings of support (four positive items from question two) and positive feelings about their staff development (five positive items from question three). The negative correlations are consistent in that those who have the hardware and the software programs on which they were trained feel less frustrated and have fewer wishes for help.

Table 16

Correlations with Availability of Hardware/Software

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school.	78	Technology staff development I participate in matches my teaching philosophy.	.448**	1
	78	I frequently use technology ideas which I learned in a technology staff development class.	.392**	3
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.385**	2
	78	I feel technology related staff development motivates me to integrate technology in my classroom.	.356**	3
	78	My teaching philosophy has changed because of technology related staff development.	.327**	3
	78	District technology integration I have participated in has been effective in teaching me skills needed to integrate technology.	.291**	3
	78	Technology integration is visible in my school.	.280*	1
	78	I have the time I need to learn new technology skills.	.279*	1
	78	Other teachers on my grade level support me with technology integration needs and ideas.	.266*	2
	78	I have access to many technology resources which can be checked out from our school media center.	.260*	1
	78	District technology integration training I have participated in has been effective in motivating me to integrate technology.	.245*	3
	78	I have the time I need to plan technology integrated lessons.	.243*	1
	78	Teachers in my school help each other with technology integration needs and ideas.	.236*	2
	78	I have resources in my school (web page, software help, etc.) which cut down on the time I need to plan technology integrated lessons.	.235*	1
	76	I have opportunities to try new technology in my school.	.226*	1
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.226*	1
	77	I feel supported with technology integration even after a technology staff development opportunity has ended.	.225*	2
	78	I wish I had someone to come to my classroom to demonstrate technology rich lessons.	-.298**	2
	78	I feel frustrated by the complexity of technology when I participate in technology staff development.	-.310**	1
	77	I often am excited about technology when I take technology related staff development, but am not able to take what I learn in the staff development and apply it to my classroom.	-.330**	3
	77	I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively	-.375**	2

** .01 level, *.05 level (2-tailed)

Table 17 shows the 16 positive and two negative correlations to the statement *When technology in my room is not working properly, it is fixed in a timely manner*, with which 88.6% of respondents agreed or strongly agreed. Nine of the correlations deal with support and the other nine deal with elements of diffusion. The two highest positive correlations deal with quickly being able to access technology support. The two negative correlations are between feeling a need for additional support and someone to model lessons within the classroom and nonworking technology being fixed quickly. A connection between observability of technology integration within a school and technology working properly is apparent in the positive correlations between this statement and visibility of technology in the school, fellow teachers' availability to model technology, sharing during faculty meetings, leaders demonstrating use of technology, and local school staff development focusing on technology integration. Triability is also apparent in positive correlations between working technology and the ability to go to demonstrations where teachers can try technology and having access to many media center resources.

Table 17

Correlations with Timeliness of repairs

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	77	When I e-mail a technology support person, I get a response quickly.	.635**	2
	78	When I have a technology related question, I can quickly find someone in my school to help me with the question.	.602**	2
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.514**	2
	78	Teachers in my school help each other with technology integration needs and ideas.	.393**	2
	78	Technology integration is visible in my school.	.383**	1
	78	When I receive technology related support, the people giving the support are patient and do not make me feel inferior for not knowing how to do something.	.362**	2
	78	Other teachers on my grade level support me with technology integration needs and ideas.	.341**	2
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.335**	1
	78	I have access to many technology resources which can be checked out from our school media center.	.304**	1
	78	Fellow teachers are available to model how to use software applications and/or hardware at my school.	.286*	1
	78	I know the names of the technology support people who serve my school.	.284*	2
	78	In addition to county staff development opportunities, my school offers technology related staff development.	.279*	1
	78	Technology ideas are shared during faculty meetings and/or other local school meetings.	.265*	1
	78	The leaders (administrators, etc) demonstrate use of technology when presenting to the faculty at my school.	.258*	1
	78	Over half of our school faculty integrates technology on a regular basis.	.232*	1
	78	Technology integration is often part of local school staff development.	.224*	1
	78	I wish I had someone to come to my classroom to demonstrate technology rich lessons.	-.295**	2
	77	I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively	-.393**	2

** .01 level, *.05 level (2-tailed)

Table 18 shows the 15 positive correlations to the statement *In addition to county staff development opportunities, my school offers technology related staff development,* with which 83.5% of respondents agreed or strongly agreed. Positive correlations appear between local school staff development opportunities and access to fellow teacher support and technology personnel support. Positive correlations also indicate a strong connection between local school staff development and high levels of visibility of technology integration within the school, with teachers and leaders sharing ideas and assisting each other with technology.

Table 18

Correlations with School Bases Staff Development Opportunities

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
In addition to county staff development opportunities, my school offers technology related staff development.	78	Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	.585**	1
	78	Technology integration is often part of local school staff development.	.472**	1
	77	Student work involving technology integration is often printed and hung in the hallways of my school.	.464**	1
	78	I have opportunities to observe other teachers integrating technology in their classrooms.	.463**	1
	78	Technology integration is visible in my school.	.455**	1
	78	Teachers in my school help each other with technology integration needs and ideas.	.378**	2
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.377**	1
	78	Over half of our school faculty integrates technology on a regular basis.	.356**	1
	78	Fellow teachers are available to model how to use software applications and/or hardware at my school.	.323**	1
	78	I have access to many technology resources which can be checked out from our school media center.	.319**	1
	77	When I e-mail a technology support person, I get a response quickly.	.290*	2
	78	When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	.279*	1
	78	When I have a technology related question, I can quickly find someone in my school to help me with the question.	.243*	2
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.242*	2
	78	The leaders (administrators, etc) demonstrate use of technology when presenting to the faculty at my school.	.233*	1

** .01 level, *.05 level (2-tailed)

Table 19 shows the 21 positive correlations to the statement *Technology integration ideas are often shared during faculty meetings and/or other local school meetings at my school*, with which 64.5% of respondents agreed or strongly agreed. Four

of the correlations deal with support, with the remaining 17 dealing with elements of diffusion. The correlations indicate all five elements of diffusion correlate with sharing of technology ideas. Support related correlations indicate both personnel support and fellow teacher support play a role in technology integration ideas being shared during faculty meetings.

Table 19

Correlations with Ideas Shared in School Meetings

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	78	In addition to county staff development opportunities, my school offers technology related staff development.	.585**	1
	78	Fellow teachers are available to model how to use software applications and/or hardware at my school.	.527**	1
	78	Technology integration is visible in my school.	.526**	1
	78	Technology integration is often part of local school staff development.	.516**	1
	78	I have access to many technology resources which can be checked out from our school media center.	.514**	1
	78	I have opportunities to observe other teachers integrating technology in their classrooms.	.489**	1
	78	Teachers in my school help each other with technology integration needs and ideas.	.453**	2
	77	Student work involving technology integration is often printed and hung in the hallways of my school.	.448**	1
	78	Over half of our school faculty integrates technology on a regular basis.	.444**	1
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.400**	1
	78	I have the opportunity to go to technology related conferences to see technology demonstrated.	.358**	1
	78	I have resources in my school (web page, software help, etc.) which cut down on the time I need to plan technology integrated lessons.	.346**	1
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.333**	2
	78	Other teachers on my grade level support me with technology integration needs and ideas.	.331**	2
	78	The leaders (administrators, etc) demonstrate use of technology when presenting to the faculty at my school.	.328**	1
	78	I have the time I need to plan technology integrated lessons.	.284*	1
	76	I have opportunities to try new technology in my school.	.281*	1
	78	When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	.265*	1
	77	When I e-mail a technology support person, I get a response quickly.	.245*	2
	78	I have access to many technology resources within my classroom.	.234*	1
	78	I have the time I need to learn new technology skills.	.226*	1

** .01 level, *.05 level (2-tailed)

Table 20 shows 15 items correlated with the statement *The leaders in my school demonstrate use of technology when presenting to the faculty at my school*, with which 58.2% of respondents agreed or strongly agreed. Of the items in which the majority of participants agreed or strongly agreed, this item received one of the lowest agreement rates. A high correlation was apparent between leaders demonstrating use of technology when presenting to faculty and teachers frequently using technology ideas that they learn in staff development. Feeling supported with technology integration even after staff development has ended and a feeling that fellow teachers help each other showed positive correlations with leadership demonstrating use of technology when presenting to the faculty. The remaining items indicate the five elements of diffusion are apparent when school leaders demonstrate use of technology. Given these correlations, emphasis should be placed on developing school leaders who demonstrate use of technology.

Table 20

Correlations with Leadership Demonstrating use of Technology

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
The leaders in my school (administrators, etc) demonstrate use of technology when presenting to the faculty at my school.	78	I have access to many technology resources which can be checked out from our school media center.	.426**	1
	77	I frequently use technology ideas which I learned in a technology staff development class.	.407**	3
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.375**	1
	78	Technology integration is often part of local school staff development.	.360**	1
	78	Technology staff development I receive helps simplify technology integration for me.	.333**	1
	78	Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	.328*	1
	77	I feel supported with technology integration even after a technology staff development opportunity has ended.	.311**	2
	78	Technology integration is visible in my school.	.302**	1
	78	When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	.258*	1
	78	Other teachers on my grade level support me with technology integration needs and ideas.	.256*	2
	78	Teachers in my school help each other with technology integration needs and ideas.	.235*	2
	78	In addition to county staff development opportunities, my school offers technology related staff development.	.233*	1
	76	I have opportunities to try new technology in my school.	.229*	1
	77	Student work involving technology integration is often printed and hung in the hallways of my school.	.227*	1
	78	Fellow teachers are available to model how to use software applications and/or hardware at my school.	.225*	1

** .01 level, *.05 level (2-tailed)

Table 21 shows the 22 items correlated with the statement *Technology integration is often part of local school staff development*, with which 76% of respondents agreed or strongly agreed. Local school staff development focused on technology integration

appears to impact teacher classroom technology integration. Effectiveness of staff development in teaching skills necessary to integrate technology and teachers frequently using ideas learned in staff development are both positively correlated with technology integration being part of local school staff development. Availability of support from both peers and technology personnel is also indicated in these correlations. Correlations indicate relative advantage, compatibility, triability, and observability are present when technology integration is part of local school staff development.

Table 21

Integration Part of Local School Staff Development

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
Technology integration is often part of local school staff development.	78	Technology integration is visible in my school.	.521**	1
	78	Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	.516**	1
	78	Teachers in my school help each other with technology integration needs and ideas.	.514**	2
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.477**	1
	78	Over half of our school faculty integrates technology on a regular basis.	.473**	1
	78	In addition to county staff development opportunities, my school offers technology related staff development.	.472**	1
	78	Other teachers on my grade level support me with technology integration needs and ideas.	.453**	2
	78	I have access to many technology resources which can be checked out from our school media center.	.442**	1
	78	I have opportunities to observe other teachers integrating technology in their classrooms.	.430**	1
	78	Fellow teachers are available to model how to use software applications and/or hardware at my school.	.417**	1
	78	The leaders (administrators, etc) demonstrate use of technology when presenting to the faculty at my school.	.360**	1
	78	Technology staff development I receive helps simplify technology integration for me.	.352**	1
	78	I have access to many technology resources within my classroom.	.327**	1
	77	I feel supported with technology integration even after a technology staff development opportunity has ended.	.311**	2
	77	Student work involving technology integration is often printed and hung in the hallways of my school.	.295**	1
	78	I frequently use technology ideas which I learned in a technology staff development class	.284*	3
	76	I have opportunities to try new technology in my school.	.381**	1
	78	I have resources in my school (web page, software help, etc.) which cut down on the time I need to plan technology integrated lessons.	.279*	1
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.268*	2
	78	District technology integration I have participated in has been effective in teaching me skills needed to integrate technology.	.251*	3
	78	I have the time I need to learn new technology skills.	.246*	1
	78	When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	.224*	1

** .01 level, *.05 level (2-tailed)

Table 22 shows the 22 items correlated with the statement *Technology integration is often part of local school staff development*, with which 76% of respondents agreed or strongly agreed. A correlation is found between this statement and frequently integrating technology within one's classroom. Correlations also indicate availability of resources and visibility of technology within the school when technology integration is part of local school staff development. Support of peers and technology support personnel are also indicated as positive correlations with this statement.

Table 22

Correlations with Frequent School Based Technology Staff Development

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
Technology integration is often part of local school staff development.	78	Technology integration is visible in my school.	.521**	1
	78	Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	.516**	1
	78	Teachers in my school help each other with technology integration needs and ideas.	.514**	2
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.477**	1
	78	Over half of our school faculty integrates technology on a regular basis.	.473**	1
	78	In addition to county staff development opportunities, my school offers technology related staff development.	.472**	1
	78	Other teachers on my grade level support me with technology integration needs and ideas.	.453**	2
	78	I have access to many technology resources which can be checked out from our school media center.	.442**	1
	78	I have opportunities to observe other teachers integrating technology in their classrooms.	.430**	1
	78	Fellow teachers are available to model how to use software applications and/or hardware at my school.	.417**	1
	78	The leaders (administrators, etc) demonstrate use of technology when presenting to the faculty at my school.	.360**	1
	78	Technology staff development I receive helps simplify technology integration for me.	.352**	1
	78	I have access to many technology resources within my classroom.	.327**	1
	77	I feel supported with technology integration even after a technology staff development opportunity has ended.	.311**	2
	77	Student work involving technology integration is often printed and hung in the hallways of my school.	.295**	1
	78	I frequently use technology ideas which I learned in a technology staff development class.	.284*	3
	76	I have opportunities to try new technology in my school.	.381**	1
	78	I have resources in my school (web page, software help, etc.) which cut down on the time I need to plan technology integrated lessons.	.279*	1
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.268*	2
	78	District technology integration I have participated in has been effective in teaching me skills needed to integrate technology.	.251*	3
	78	I have the time I need to learn new technology skills.	.246*	1
	78	When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	.224*	1

** .01 level, *.05 level (2-tailed)

Table 23 shows the 18 items correlated with the statement *I have the time I need to plan technology integrated lessons*, with which 57% of respondents disagreed or strongly disagreed. With over half of respondents reporting not enough time to plan technology integrated lessons, ways to provide more time for planning and sharing of resources need to be examined. Three of the negative correlations with this statement indicate a desire for more support personnel who can help teachers improve their technology integration. The other negative correlation suggests a frustration with the complexity of technology. These negative correlations show a tie between having the time needed to plan technology integrated lessons and teacher comfort level with integrating technology on their own. Those more comfortable with technology may require less time preparing to use it. Access to peer and personnel support positively correlate with having time to plan technology integrated lessons. In addition, correlations indicate the presence of elements of diffusion are important to teachers in having time to plan technology integrated lessons.

Table 23

Correlations with Time to Plan

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I have the time I need to plan technology integrated lessons.	78	I have the time I need to learn new technology skills.	.663**	1
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.472**	1
	78	I have opportunities to observe other teachers integrating technology in their classrooms.	.383**	1
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.370**	2
	78	I have resources in my school (web page, software help, etc.) which cut down on the time I need to plan technology integrated lessons.	.327**	1
	78	I have access to many technology resources which can be checked out from our school media center.	.325**	1
	78	Fellow teachers are available to model how to use software applications and/or hardware at my school.	.295**	1
	78	Teachers in my school help each other with technology integration needs and ideas.	.295**	2
	78	When I have a technology related question, I can find someone in my school to help me with the question.	.285*	2
	78	Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	.284*	1
	78	Other teachers on my grade level support me with technology integration needs and ideas.	.278*	2
	77	Student work involving technology integration is often printed and hung in the hallways of my school.	.263*	1
	78	Technology integration is visible in my school.	.249*	1
	78	I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school	.243*	1
	77	I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively.	-.225*	2
	77	I feel a technology support person who could visit my classroom when needed and help me with integrating new software for the first time would make me more likely to integrate technology	-.234*	2
	78	I feel frustrated by the complexity of technology when I participate in technology staff development.	-.361**	1
	78	I wish I had someone to come to my classroom to demonstrate technology rich lessons.	-.452**	2

** .01 level, *.05 level (2-tailed)

Table 24 shows the 25 items correlated with the statement *I have the time I need to learn new technology skills*. Responses to this item showed no strong leaning towards the agree/strongly agree or disagree/strongly disagree side of the rating scale. Nearly 40% of respondents responded on both the agree/strongly agree and disagree/strongly agree sides with 22.8% of respondents answering undecided. It is important to note that time to learn new skills showed correlations with motivation to integrate technology, change in teaching philosophy, and effectiveness in learning skills needed to integrate. Access to support and resources also correlate with having time to learn new technology skills. A negative correlation was found between time to learn new technology skills and a feeling of frustration with technology and the desire for more support.

Table 24

Correlations with Time to Learn

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I have the time I need to learn new technology skills.	78	I have the time I need to plan technology integrated lessons.	.663**	1
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.432**	2
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.356**	1
	78	I have access to many technology resources which can be checked out from our school media center.	.341**	1
	78	I have the opportunity to go to technology related conferences to see technology demonstrated.	.333*	1
	76	I have opportunities to try new technology in my school.	.320**	1
	78	Teachers in my school help each other with technology integration needs and ideas.	.313**	2
	77	Student work involving technology integration is often printed and hung in the hallways of my school.	.296**	1
	78	District technology integration training I have participated in has been effective in teaching me skills needed to integrate technology.	.292**	3
	78	When I have a technology related question, I can find someone in my school to help me with the question.	.291**	2
	78	Technology integration is visible in my school.	.286*	1
	78	I have opportunities to observe other teachers integrating technology in their classrooms.	.282*	1
	78	I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school	.279*	1
	78	Technology staff development I participate in matches my teaching philosophy.	.266*	1
	78	District technology integration training I have participated in has been effective in motivating me to integrate technology.	.261*	3
	78	Technology staff development I receive helps simplify technology integration for me.	.257*	1
	78	My teaching philosophy has changed because of technology related staff development.	.247*	1
	78	Technology integration is often part of local school staff development.	.246*	1
	78	I feel technology related staff development motivates me to integrate technology in my classroom.	.245*	3
	78	I have access to many technology resources within my classroom.	.240*	1
	78	Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	.226*	1
	78	I feel technology related staff development is repetitive and does not offer opportunities to learn new programs.	-.268*	1
	78	I feel frustrated by the complexity of technology when I participate in technology staff development.	-.382**	1
	78	I wish I had someone to come to my classroom to demonstrate technology rich lessons.	-.398**	2
	77	I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively	-.437**	2

Table 25 shows the 14 items correlated with the statement *I have resources in my school which cut down on the time I need to plan technology integrated lessons*, with which 62% of respondents agreed or strongly agreed. A negative correlation of particular importance is the one found between inability to take what is learned in staff development and integrate it within the classroom and access to resources with the school. Positive correlations were apparent between teachers helping each other with technology and access to support whenever needed. Relative advantage, compatibility, complexity, and observability are elements of diffusion present in correlations dealing with access to school resources.

Table 25

Correlations with Available Resources

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I have resources in my school (web page, software help, etc) which cut down on the time I need to plan technology integrated lessons.	78	I have access to many technology resources which can be checked out from our school media center.	.569**	1
	78	Technology integration is visible in my school.	.434**	1
	78	I have the opportunity to go to technology related conferences to see technology demonstrated.	.374**	1
	78	Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	.346**	1
	78	Fellow teachers are available to model how to use software applications and/or hardware at my school.	.344**	1
	78	Technology staff development I receive helps simplify technology integration for me.	.340**	1
	78	I have the time I need to plan technology integrated lessons.	.327**	1
	78	Over half of our school faculty integrates technology on a regular basis.	.307**	1
	78	Teachers in my school help each other with technology integration needs and ideas.	.293**	2
	78	Technology integration is often part of local school staff development.	.279*	1
	78	Other teachers on my grade level support me with technology integration needs and ideas.	.259*	2
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.251*	2
	78	I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school.	.235*	1
	77	I often am excited about technology when I take technology related staff development, but am not able to take what I learn in the staff development and apply it to my classroom	-.312**	3

** .01 level, *.05 level (2-tailed)

Table 26 shows the 14 items correlated with the statement *Technology staff development I participate in matches my teaching philosophy*, with which almost all (96.2%) of respondents agreed or strongly agreed. Staff development impacting classroom practice via motivating teachers to integrate technology, teaching technology skills needed, and changing teaching philosophy all are present in positive correlations with technology staff development matching teacher's teaching philosophy. In addition, peer and technology personnel support correlated with staff development matching teacher's teaching philosophy. Negative correlations indicate the more frustrated a

participant is with complexity and desire for more support, the less likely staff development is to match their teaching philosophy.

Table 26

Correlations with Staff Development Matching Teaching Philosophy

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
Technology staff development I participate in matches my teaching philosophy.	78	I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school	.448**	1
	78	I feel technology related staff development motivates me to integrate technology in my classroom.	.386**	3
	78	District technology integration training I have participated in has been effective in motivating me to integrate technology.	.385**	3
	78	District technology integration I have participated in has been effective in teaching me skills needed to integrate technology.	.383**	3
	78	Technology staff development I receive helps simplify technology integration for me.	.382*	1
	78	I have the opportunity to go to technology related conferences to see technology demonstrated.	.315**	1
	78	My teaching philosophy has changed because of technology related staff development.	.283*	3
	77	I enjoy tech related staff development.	.270*	1
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.268*	2
	78	I have the time I need to learn new technology skills.	.266	1
	78	I know the names of the technology support people who serve my school.	.264*	2
	78	Teachers in my school help each other with technology integration needs and ideas.	.226*	2
	77	I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively.	-.305**	2
	78	I feel frustrated by the complexity of technology when I participate in technology staff development.	-.240*	1

*** .01 level, *.05 level (2-tailed)*

Relative Advantage and Compatibility Qualitative Analysis

Qualitative data demonstrated relative advantage and compatibility between teachers' thoughts about technology integration and the technology staff development program. Data coded (a) time, (b) access, (c) engagement and/or enjoyment, (d) choice, (e) special student needs and/or special education, and (f) relative advantage and/or compatibility were further analyzed under the umbrella of relative advantage and compatibility. Data coded in these categories were further clustered to form subheadings to address the area of the relative advantage and compatibility part of question one

qualitatively. The subheadings are: (a) staff development is practical and transferable to the classroom setting, (b) staff development meets teachers' individual needs and provides choices for teachers, (c) staff development leads to teacher growth and excitement, (d) staff development involves access to resources, (e) teachers believe that technology is the way to engage all students and provide them skills needed in life, (f) staff development helps with time. Quotations are included that illustrate subheadings. In addition, any concerns voiced regarding that subheading are addressed. The following quotations that illustrate these factors of diffusion were collected as part of the open ended section of the online survey and through teacher web logs and interviews.

Staff development practical and transferable to the classroom setting. A common theme found in the qualitative data was what was learned in the staff development could be easily transferred to the classroom setting in practical ways. One practical element, specifically mentioned was that the technology allowed teachers to prepare and or review for standardized testing in a more enjoyable way for the students and informative way for the teachers. Teachers thinking the program was practical and transferable to the classroom setting indicates strong relative advantage and compatibility. A sampling of quotations indicating teachers feel the program is practical and transferable to the classroom setting from the online open ended questions, teacher interviews, and web logs follow. Open ended responses on the online survey are below.

> The classes I have taken have been great. Very informative and the promethean classes in particular were very applicable to what I want to do in my class.

> This has been more applicable to my students. The previous ones [staff development opportunities] have been more about me and my needs as an educator.

> The classes are much more comprehensive and useful in the classroom. I feel like the students are really going to benefit from what I am learning. I'm not just being taught what to teach, but how to teach it.

The following quotations from interviews triangulate with the open ended responses from the online survey and indicate the program was practical and transferable to the classroom setting. The interview responses also indicate that previous staff development was not always as practical or transferable.

> I think they have done a lot to empower us. I think the way they have had the classes that it is practical…. You are ok, the next class try this in your room or pick a standard from your grade level and develop something come back and use it. I think that is empowering. It is not like you are just wasting your time. It is something that is useful for you and for your kids. (Interview 10)

> I think the biggest difference with this as opposed to other staff development programs has been a lot of times staff development is not relevant. It's not something you have access too. It is not something that you can even feasibly do. Whereas I think they have taken a lot of care and a lot of time has gone into making everything something we have. (Interview 12)

> One of the biggest changes is just the application. The application of everything that I get from these classes. I pretty much take straight forward to my class. … I would say 80-90% are actual things I come back to the classroom and actually use. Whereas other times you take the workshop, the book sits on the shelf and it doesn't get used as often as it should. (Interview 14)

The following response from a teacher web log also triangulates with the other data sources indicating the staff development program was practical and transferable to classroom activities.

> Today, we continued reviewing for the GCRCT. Instead of giving the students pencil and paper for the review lesson, we used our Acti-votes. … I especially loved the fact that I could view the results. I was able to plan instruction according to their answer choices. The statistics let me know what material needed to be taught more in depth and what material was understood. (Web log 1)

Staff development met teachers' individual needs and provided choices for teachers. Choice was not a code in the initial focus for coding, but a common theme that could not be ignored throughout the qualitative data. The choice factor appeared to allow teachers to make the staff development relevant to their personal learning needs and the learning needs of their students. Even the program director believed choice was a big factor in the success of the first year of the program.

> I think the main reason that this has been successful for us is that it was by choice. We have spent a lot of time training teachers through InTech and even though most of them, after they got here were kind of excited about what they were going through it wasn't their choice. It was a requirement and you know a lot of them came through the door with some kind of resentment of this is something I have to get through. This is something the teachers applied for so you knew right away you had the people who were thirsty. (program director interview)

The following samplings of quotations from the online survey illustrate the factor of choice being important in this staff development endeavor.

> I like that I have a choice of classes to take so that I am not having to learn what I already know and have an opportunity to expand my knowledge and not just use the courses as fillers.

> I chose the courses I take, and when to take them, which results in greater learning and ability to transfer that learning to my classroom.

> Other technology developments have been taught for one day and usually forgotten or not followed up on to check for understanding. This program provides a multitude of courses that you can select according to interest. You can follow up at any time or receive the resources required to build and teach the lesson.

The following quotations from teacher interviews triangulate with the online open ended survey responses indicating choice as a factor in the success of the staff development

program. Because of the choices available in the program, teachers were better able to gear their staff development opportunities to their personnel learning needs and the needs of their students.

> I have the ability to choose how I'm going to use this specifically for myself. It is not just something just thrown out there as a possibility for regular ed classrooms, but I can take it in the gifted area and be able to use it in my area. (Interview 2)

The following web log entry also illustrates how choice has allowed teachers to customize their staff development experience to meet their learning needs.

> The flexibility in courses and tasks will give each of us an experience tailored to our needs! (Web log 11)

One concern was mentioned in regards to how teachers with differing technology abilities will have their needs met in future technology staff development. Because this program was a teacher choice and the first year of the program implementation, the majority of the participants were technology savvy. As a result, teachers did not feel they were being held back by participants with less technology ability. A concern was expressed with how these varied needs are going to be addressed as more teachers enroll in the program.

> About the only concern that I ever have about that and this maybe not even concerned with the first [program name] folks because the first people who went out especially in this building were already using technology. But, now people see what there is to be had and pretty much anyone who fills out the paperwork gets selected so what that does is when you are in the classes you have people up here and then you have people who when you say highlight the text they get out a highlighter and write on the screen. They can't use a mouse. We always talk about meeting the learner and differentiating instruction. Well, I'm a learner too and some of that wastes your time. I wish that the training could be leveled somehow I understand that would be highly difficult to do. (Interview 5)

Staff development leads to teacher growth and excitement. Qualitative data in this section illustrate how teachers reflect on their learning and excitement about the program.

A sense of excitement is expressed as the teachers are happy about their own learning accomplishments and how their learning is helping them to be more engaging teachers. The excitement for the program shows compatibility. The program director indicated teachers were energized about teaching again.

> I've had several email or tell me personally I just kind of felt like I was stuck in a rut and now with some new things to present to my students, I'm feeling energized myself.

The following quotations are from the online survey and indicate enjoyment and teacher growth within the staff development experience.

> [Program name] has begun a new chapter in my life as a teacher. It has opened new doors to my children and to me.

> This experience has pushed me to learn new things, challenge myself, and in-turn, challenge my students. It has opened my eyes to a new way of teaching.

The following interview quotation triangulates with the online survey responses and demonstrates how a teacher feels she has grown because of this program. Although only one interview direct quotation is provided in this section, all sixteen teachers were very excited about the program and felt they had learned new skills that they were able to incorporate in their teaching.

> I was called mouse handicapped and I joked about that at my other school because whenever anything would happen I would just run to the tech person and she would do it for me. I didn't learn it. … By having the constant reinforcement I was learning that I wasn't the only one who was an immigrant out into this wide vast space that I wasn't raised with this and so there for it doesn't come as easy. It does take me longer but once I get my paddles wet then we really start rolling with it. I'm not afraid now to make errors. …I've taught for over 25 years and if something went wrong with the Promethean Board the kids would help me. I thought well if they can pick it up, then I can pick it up. So it's like with every single day I have become more involved and an engaged learner not just a teacher, but I'm also learning every single day. (Interview 7)

Staff Development involves access to resources. Access to technology equipment was a common theme. Teachers were appreciative of the technology made available to them and indicated that this was not always the case in previous technology staff development. Classroom level access to the hardware and software taught in the staff development allowed them to integrate the technology that they were learning. Access to equipment also helped with teacher and student excitement. Access relates to relative advantage, because access to equipment is needed for a higher level of relative advantage. The following quotations are a sampling from the online open ended responses in relation to access to resources.

> The amount of technology that has been given to us is amazing and I feel very blessed to be a part of this program. My students are also very excited about all the "new" stuff in the room!
>
> My students tell me how lucky they are to have all of this technology in the room - I realize how accurate that statement is. Part of my decision to move to the new elementary school next year was based on the fact that it will be a 21st century school. This means that every classroom will have a Promethean board and installed LCD projector. I am so excited to teach and watch students learn in that type of environment.
>
> The amount of technology, training and support has been unprecedented.
>
> This professional development gave me new and innovative equipment to use with my students. No other professional development class has given materials/equipment at the level of [program name]--it has been total immersion!
>
> This technology has been easier for us to integrate. We have been introduced to all this technology and also been given the software etc. to be able to implement it. Staff developments in the past have either been too complicated for Kindergarten or we didn't have some of the software available.
>
> I have the equipment back in my room so I can use new ideas with my students right away.

Interviewees also expressed that the resources made available to them allowed them to utilize what was learned in staff development classes. The following quotations from interviews triangulate well with the above open ended responses from the online survey.

> I think the best thing about this particular program is that we haven't just been shown the technology, but we have gotten it in our classrooms. When we've gone to staff development before it was like this is so wonderful and this is so great but we got one per school or one per county and you could check it out. This time we knew we were getting everything in our classroom. … I think just having the technology there it has made me braver I guess I've experimented more. (Interview 3)

> I think it is so important to have the resources there because I've been to so many staff developments where there was one per school or one per county and you could never get your hands on it and that is just not very helpful. (Interview 3)

One teacher shared in her web log that she felt "like a child awaiting a precious gift" when technology resources arrived in her classroom.

> We have received our new computers - it has only heightened the students' excitement. They are now asking me almost every day when we will be our "clickers" [Active votes] as they call them. … I also am anxious for the "clickers" to arrive - I feel like a child awaiting a precious gift. (Web log 8)

Access Concerns. Six statements from 284 open ended responses indicated access concerns on the online survey. Most of these concerns dealt with classrooms where because of technical difficulties, it was late in the school year before all the equipment was up and running. Despite these access concerns mentioned about the school year in which the technology was initially installed, teachers appeared to also address the fact that they were excited about what they were able to do during the shortened time the technology was available and were looking forward to full access to technology the following year.

> I have tried to bring in more technology based lessons but I have not had easy access to the equipment until recently. I would be able to do a lot more if I had a

> wireless lab. I have found that much of our computer lab time goes to the math teachers for Sucess Maker.

> I took 4 classes this year without the technology in my classroom. It was delivered after the classes. I am now making sense of what I was taught, but I am learning on the job. My students are patient and curious, so they help me.

Interviewees indicated an access concern with the fact that they had outgrown the five computers in the room being enough. The program appears to be leading teachers to a desire for a one to one computer initiative.

> Number of computers I would use. There are definitely things I could do if I had more. I did my capstone and I asked for 23 desktop computers for third grade so everyone will have their own. So that was really the only thing. The nice thing is with the capstone we were allowed to ask for equipment and software so anything that I felt I was missing I requested and hopefully I will get them. (Interview 8)

> I've gone beyond 5 computers in the classroom being enough. I'm in a mobile [which is wireless accessible] so pulling the mobile lab to my room doesn't work [because of the trouble of getting the cart to the mobile classroom]. We actually go to the media center. We pick up computers. We carry them one by one here. Each student carries a computer and they use it and that works fine and we've had some lessons where we actually worked in the media center. (Interview 11)

Belief that technology is the way to engage all students and provide them skills needed in life. Many teachers indicated they believed technology was important in engaging students because of the widespread use of technology among students and also the demand for technology skills in the workplace. These quotations illustrate compatibility between teachers' beliefs and technology integration. The following quotations from the online open ended responses indicate teachers felt technology was a means of engaging students and a needed life skill.

> I like being on the cutting edge, and I fully believe that technology is the way to go.

> I have seen countless opportunities for student engagement when learning the new software and strategies. …Part of my decision to move to the new elementary school next year was based on the fact that it will be a 21st century school. This means that every classroom will have a Promethean board and installed LCD projector. I am so excited to teach and watch students learn in that type of environment.
>
> This program is student centered. Not only are we gaining technological experience/knowledge, we are giving students the tools they need to succeed in school and life.

Teachers also indicated in interviews that technology skills are needed life skills and technology provides a means of engaging students. Technology helped with all students, even students with special learning needs and active students. These interview quotations triangulate with the above open ended responses.

> I think for me especially since I have gifted students they need to be on the cutting edge of technology. I think a lot of these programs they have done even with the younger kids are very challenging. I have challenged them to the limit on some of the things they have done. They have become frustrated, but it is in the way I have become frustrated. But, they have worked past it and when they have their final project to show they are just so excited about it. I think that is just awesome when they can show a Photostory or something they have created with technology it is awesome The parents came in today to see some of the things they have done and their mouths were dropping open I didn't know they could do that they were very impressed (Interview 2)
>
> I have a handicapped child in my classroom. A child in a wheelchair. She can't get close enough to use the board. I had the [trainer] come in and show me how to use the Activeslate and I got it going and now this student is using it and loves it. She gets real excited. She volunteers more. She used to not volunteer for anything, but she is not the only one. I have some students in here who struggle in some of their academics, but also struggle with staying on task and it seems to me that there is a significant increase in their on task work. As long as I have that board going I have their attention. They love to interact with the board, come up and do something on the board. (Interview 4)
>
> I have had a lot of kids who came in here, boys in particular, who were highly reluctant writers. But, the incentive of having the technology and having the laptop assigned to them and knowing the writing process and the revision process has just made it easier and prompted them to become better writers. (Interview 5)

> We have done some video podcasts. It is very enlightening to watch an autistic student who won't even look at me when he speaks to me, but we put him in front of a camera and let him write a script and they're doing all the animation and performing the script completely and they are just so thrilled with the process. I've been surprised with the product they have come up with without really any assistance on my part. (Interview 15)

Two web log entries indicated how the technology and staff development experience helped teachers engage students with special needs. These web log entries triangulate with the other qualitative data indicating teachers believed technology allowed them to engage students and provide them with life skills.

> Today, my class and I finished a writing project in which we used Word. … It worked out very well. I was pleasantly surprised with their prior computer knowledge. One of my students [initials] was very impressive. He is a student who normally struggles with writing. His writing typically cannot be read, and he is very unorganized. He amazed me on the computer and wrote the best story he has ever written. I plan to let him use Word every time he writes. I know that some teachers believe that all the tools should not be accessible because you don't get a "true picture" of the student's writing. However, I believe this is a life skill. I never write anything without using spell check and or other tools. I am trying to teach my students to write their story the best way that they can, but then if they can improve it using tools on the computer--that's even better. (Web log 3)

Staff development helped with time. Time is a factor associated with relative advantage. If new ideas are too time consuming to implement, it is not likely to lead to adoption. Several teachers indicated that the staff development program helped them with time by providing classes at times that were convenient and by providing time in classes to develop projects to implement in class. These ideas were present in the two interview responses and one web log entry.

> I think the main limits is just what teachers always complain about is time to plan, time to implement. This program has been real helpful with that because the classes we take have time built into them for building a PowerPoint, not a

> PowerPoint but like a story a digital story or a movie maker or in promethean classes we build a page we built things like that so that has helped (Interview 11)

> I also want to mention how thoughtful and timesaving it is that [program director name], and anyone else who helped, took the time to set up our electronic portfolios. It will really make the record keeping and tasks much less time consuming! Some of us have had experiences with less prepared programs and are already impressed with the effort and forethought that is apparent in this brand new program. Kudos [county name] Tech Dept!! (Web log 11)

Time was also a concern or a hindrance to utilizing the technology even more frequently. The following quotations from interviews and web logs illustrate this concern.

> The hard part that I'm finding is finding the time to create everything. With the promethean board it's awesome but it is time consuming to go in and say create a lesson on money, I have to create something to go with the lesson on money – just like if say I created a PowerPoint – it has to be created before I can use it. I'm still trying to find the time and balance it, but I think over the summer I will be able to mass create a bunch of flip charts or really get a feel for what I want to use them for. (Interview 1)

> I think it is because I am always pressed for time and rarely have a moment to think things through before rushing in to get something done. I think that lack of time is what turns off many teachers from using technology. The training is out there and the resources are available, but it all takes valuable time away from our busy schedules. (Web log 5)

A few concerns were found that would fall under the category of relative advantage and compatibility, but do not fall under the clustered categories previously mentioned. Two of the 71 participants responding to the online open ended questions expressed concerns about the amount of work required in the program. One of the two quotations indicates that there may have been pressure from someone else, possibly a school administrator, to enroll in the program.

> Too much work to do. It's like a pseudo grad program.

> Overwhelming. I was already responsible for many things at my school, then to have this on top was too much. Proper consideration of commitments was not given.

In addition, some teachers expressed concerns about testing pressure and the methods of testing being different from technology integration methods during interviews.

> The major thing right now is the testing issues knowing that at the end of the year that they are going to be tested on a pencil and paper test makes you afraid to use technology in everything you do. (Interview 3)

> If we didn't have No Child Left Behind and didn't have to worry about tests. [interview 5 in response to what would make her feel more empowered]

Complexity Quantitative Analysis

Complexity deals with the ease of use of a new technology (Rogers, 1995). The items in Table 27 were included in the online survey to gather information about complexity in relation to this staff development program. The majority of teachers agreed or strongly agreed that the staff development experience helped simplify technology integration for them. The majority of teachers disagreed or strongly disagreed that technology staff development moved too fast for them to learn new skills and that they felt frustrated by the complexity of the technology presented during staff development.

Table 27

Complexity Survey Item Frequencies

	N	*Strongly Disagree*	*Disagree*	*Undecided*	*Agree*	*Strongly Agree*
I feel that technology related staff development often moves too fast for me to learn the skills which I need.	78	35.9% (28)	34.6% (27)	7.7% (6)	15.4% (12)	6.4% (5)
I feel frustrated by the complexity of technology when I participate in technology staff development.	79	35.4% (28)	50.6% (40)	8.9% (7)	5.1% (4)	0 (0)
Technology staff development I receive helps simplify technology integration for me.	79	0 (0)	7.6% (6)	10.1% (8)	68.4% (54)	13.9% (11)

Table 28 shows the eight items correlated with the statement *I feel technology related staff development moves too fast for me to learn the skills which I need*, with which 70.5% of respondents disagreed or strongly disagreed. This is one of the highest levels of disagreement which could indicate participants were already technology savvy and/or the instructors were well equipped to meet diverse learning needs. A negative correlation between the effectiveness of the staff development on teaching the skills necessary for integrating technology and the feeling that staff development moves too fast was revealed in the data analysis. A feeling of frustration with the complexity of technology is positively correlated with the feeling that technology staff development moves too fast. This correlation could further indicate the majority of participants, who disagreed with this item, were technology savvy prior to the staff development. Having technology repaired in a timely manner, knowing the names of support personnel and the opportunity to observe other teachers negatively correlated with feeling that technology staff development moved too fast. A desire for more support positively correlated with feeling that technology staff development moved too fast. These correlations indicate support outside of staff development classes may assist with teachers' technology staff

development perceptions, in particular the feeling that staff development moves too fast for them to gain the skills they need.

Table 28

Correlations with Pace of Staff Development

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I feel that technology related staff development often moves too fast for me to learn the skills which I need.	77	I feel frustrated by the complexity of technology when I participate in technology staff development.	.570**	1
	76	I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively.	.425**	2
	77	I wish I had someone to come to my classroom to demonstrate technology rich lessons.	.423**	2
	77	I know the names of the technology support people who serve my school.	-.229*	2
	77	District technology integration I have participated in has been effective in teaching me skills needed to integrate technology.	-.233*	3
	77	I have opportunities to observe other teachers integrating technology in their classrooms.	-.234*	1
	77	When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	-.270*	1
	75	I feel frustrated in technology related staff development because I feel I am taking a class on information I already know.	-.371**	1

** .01 level, *.05 level (2-tailed)

Table 29 shows the 20 positive correlations and one negative correlation with the statement *Technology staff development I receive helps simplify technology integration for me*, with which 82.3% of respondents agreed or strongly agreed. The strongest positive correlation was between staff development simplifying technology integration and a feeling of motivation to integrate technology because of technology staff development. In addition, correlations indicate further impact on classroom practice with a tie between staff development simplifying technology integration and providing the skills needed to integrate technology and motivating teachers to integrate technology. A

feeling of access to technology support whenever needed, including after a class has ended, and recognition of fellow teachers helping each other with technology integration needs and ideas all show positive correlations to staff development simplifying technology integration in the realm of support. Many items related to elements of diffusion were positively correlated with staff development simplifying technology integration. The one item related to elements of diffusion which showed a negative correlation with the statement that staff development helps simplify technology was an item expressing a feeling of frustration with the complexity of technology.

Table 29

Correlations with Staff Development Simplifying Technology Integration

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
Technology staff development I receive helps simplify technology integration for me.	78	I feel technology related staff development motivates me to integrate technology in my classroom.	.456**	3
	78	Teachers in my school help each other with technology integration needs and ideas.	.430**	2
	78	Technology integration is visible in my school.	.405**	1
	77	Student work involving technology integration is often printed and hung in the hallways of my school.	.400**	1
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.389**	1
	78	Technology staff development I participate in matches my teaching philosophy.	.382**	1
	78	District technology integration I have participated in has been effective in teaching me skills needed to integrate technology.	.362**	3
	78	District technology integration training I have participated in has been effective in motivating me to integrate technology.	.360**	3
	78	Technology integration is often part of local school staff development.	.352**	1
	78	I have opportunities to observe other teachers integrating technology in their classrooms.	.347**	1
	78	I have resources in my school (web page, software help, etc.) which cut down on the time I need to plan technology integrated lessons.	.340**	1
	78	The leaders (administrators, etc) demonstrate use of technology when presenting to the faculty at my school.	.333**	1
	78	I have opportunities to try new technology in my school.	.304**	1
	78	Fellow teachers are available to model how to use software applications and/or hardware at my school.	.285*	1
	77	I feel supported with technology integration even after a technology staff development opportunity has ended.	.274*	2
	78	I have the opportunity to go to technology related conferences to see technology demonstrated.	.266*	1
	77	I enjoy tech related staff development	.264*	1
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.262*	2
	78	I have the time I need to learn new technology skills.	.257*	1
	78	I have access to many technology resources which can be checked out from our school media center.	.243*	1
	78	I have access to many technology resources within my classroom.	.234*	1
	78	I feel frustrated by the complexity of technology when I participate in technology staff development.	-.232*	1

** .01 level, *.05 level (2-tailed)

Table 30 shows the 14 items correlated with the statement *I feel frustrated by the complexity of technology when I participate in technology staff development*, with which

86% of respondents disagreed or strongly disagreed. This high level of disagreement could indicate the majority of participants were previously comfortable with technology and/or that staff development helped simplify technology integration. A desire for more support and for someone to demonstrate lessons within one's own classroom were both highly positively correlated with the feeling of frustration with the complexity of technology. Quick responses to technology related questions, peer teacher support, and a feeling of access to support whenever needed were all negatively correlated with frustration with the complexity of technology. The strongest positive correlation was between frustration with the complexity of technology and the feeling that staff development moves too fast. In addition, the feeling that staff development matches one's teaching philosophy negatively correlates with a feeling of frustration with the complexity of technology.

Table 30

Correlations with Frustration with Complexity of Technology

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I feel frustrated by the complexity of technology when I participate in technology staff development.	77	I feel that technology related staff development often moves too fast for me to learn the skills which I need.	.570**	1
	77	I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively	.501**	2
	78	I wish I had someone to come to my classroom to demonstrate technology rich lessons.	.442**	2
	78	Technology staff development I receive helps simplify technology integration for me.	-.232*	1
	78	Technology staff development I participate in matches my teaching philosophy.	-.240*	1
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	-.290*	2
	78	Teachers in my school help each other with technology integration needs and ideas.	-.298**	2
	78	I have access to many technology resources within my classroom.	-.300**	1
	78	I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school	-.310**	1
	78	When I have a technology related question, I can find someone in my school to help me with the question.	-.317**	2
	78	I have opportunities to observe other teachers integrating technology in their classrooms.	-.349**	1
	78	I have the time I need to plan technology integrated lessons.	-.361**	1
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	-.362**	1
	78	I have the time I need to learn new technology skills.	-.382**	1

** .01 level, *.05 level (2-tailed)

Complexity Qualitative Analysis

The following quotations show elements of reduced complexity in the teachers' responses. Complexity is reduced when technology is easy to use and makes one's tasks easier to accomplish. This program appears to reduce the complexity of technology by making technology easier to use. Having access to resources within the classroom at the

same time as receiving training on how to use the equipment appears to reduce the complexity of the technology to be integrated. The following quotations from open ended responses on the online survey and one interview indicate how easy access to equipment along with staff development makes technology less complex.

> Normally we are trained on how to do something then several weeks later we get the technology. By the time we get the technology I have forgotten how to use it.
>
> The Promethean board has just put a whole new slant on teaching. Before that [the program] I had a projector in my room, but it was shared by everyone in the hallway. It wasn't mounted [on the ceiling] so it was pretty much useless because by the time we got it out and got it set up it was more a pain than it was worth. So if I showed the kids a video from Peachstar I would just gather them around the computer. (Interview 3)

Observability Quantitative Analysis

Observability is the visibility of an innovation to others (Rogers, 1995). People are more likely to adopt an innovation that they see others using. Table 31 shows the frequencies of responses to items on the online survey related to observability. Over 90% of teachers agreed or strongly agreed that technology integration was visible in their school. Over 70% of teachers agreed or strongly agreed that fellow teachers were available to model how to use software or hardware and that over half the school faculty integrated technology. Over half of teachers agreed or strongly agreed that student work involving technology integration was displayed in their school and that they had opportunities to go to technology related conferences. Just over 40% of teachers agreed or strongly agreed that they had opportunities to observe other teachers integrating technology in their classrooms.

Table 31

Observability Survey Item Frequencies

	N	*Strongly Disagree*	*Disagree*	*Undecided*	*Agree*	*Strongly Agree*
Technology integration is visible at my school.	79	1.3% (1)	3.8% (3)	3.8% (3)	44.3% (35)	46.8% (37)
Fellow teachers are available to model how to use software applications and/or hardware at my school.	79	3.8% (3)	13.9% (11)	12.7% (10)	39.2% (31)	30.4% (24)
Over half of our school faculty integrates technology on a regular basis.	79	1.3% (1)	12.7% (10)	13.9% (11)	48.1% (38)	24.1% (19)
I have opportunities to observe other teachers integrating technology in their classrooms.	79	10.1% (8)	35.4% (28)	13.9% (11)	24.1% (19)	16.5% (13)
Student work involving technology integration is often printed and hung in the hallways of my school.	78	2.6% (2)	19.2% (15)	15.4% (12)	53.8% (42)	9.0% (7)
I have the opportunity to go to technology related conferences to see technology demonstrated.	79	7.6% (6)	20.3% (16)	20.3% (16)	38.0% (30)	13.9% (11)

Table 32 shows the 30 items that correlated positively with the statement *Technology integration is visible in my school*, with which 91.1% of respondents agreed or strongly agreed. Access to fellow teacher support and technology support personnel correlate with visibility of technology within the school. The feeling of teachers helping each other with technology integration ideas and needs was the highest correlated item to visibility of technology within the school. Visibility also impacts classroom technology integration with correlations with staff development being motivating and effective in teaching skills. Frequently using ideas learned in staff development also positively correlates with visibility. All five elements of diffusion are also related to visibility.

Table 32

Correlations with Visibility of Technology

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
Technology integration is visible in my school.	78	Teachers in my school help each other with technology integration needs and ideas.	.713**	2
	78	Fellow teachers are available to model how to use software applications and/or hardware at my school.	.676**	1
	78	I have access to many technology resources which can be checked out from our school media center.	.602*	1
	77	Student work involving technology integration is often printed and hung in the hallways of my school.	.537**	1
	78	Other teachers on my grade level support me with technology integration needs and ideas.	.527**	2
	78	Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	.526**	1
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.524**	2
	78	Technology integration is often part of local school staff development.	.521**	1
	78	Over half of our school faculty integrates technology on a regular basis.	.484**	1
	78	In addition to county staff development opportunities, my school offers technology related staff development.	.455**	1
	78	I have resources in my school (web page, software help, etc.) which cut down on the time I need to plan technology integrated lessons.	.434**	1
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.410**	1
	78	Technology staff development I receive helps simplify technology integration for me.	.405**	1
	78	When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	.383**	1
	76	I have opportunities to try new technology in my school.	.369**	1
	78	I have opportunities to observe other teachers integrating technology in their classrooms.	.347**	1
	78	When I have a technology related question, I can find someone in my school to help me with the question.	.345**	2
	78	I feel technology related staff development motivates me to integrate technology in my classroom.	.345**	3
	78	The leaders (administrators, etc) demonstrate use of technology when presenting to the faculty at my school.	.302**	1
	77	When I e-mail a technology support person, I get a response quickly.	.329**	2
	78	I have access to many technology resources within my classroom.	.289*	1
	78	I have the time I need to learn new technology skills.	.286*	1
	78	I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school.	.280*	1
	78	District technology integration training I have participated in has been effective in motivating me to integrate technology.	.275*	3
	78	District technology integration I have participated in has been effective in teaching me skills needed to integrate technology.	.262*	3
	78	I have the time I need to plan technology integrated lessons.	.249*	1
	78	I frequently use technology ideas which I learned in a technology staff development class.	.240*	3
	77	Fellow teacher taught a lesson.	.235*	2
	77	I feel supported with technology integration even after a technology staff development opportunity has ended.	.234*	2
	78	I have the opportunity to go to technology related conferences to see technology demonstrated.	.234*	1

** .01 level, *.05 level (2-tailed)

Table 33 shows the 19 items correlated with the statement *fellow teachers are available to model how to use software applications and/or hardware at my school*, with which 69.6% of respondents agreed or strongly agreed. Access to peer and personnel support positively correlated with this statement. All elements of diffusion were also present in correlations with fellow teachers available to model how to use technology.

Table 33

Correlations with Fellow Teacher Modeling

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
Fellow teachers are available to model how to use software applications and/or hardware at my school.	78	Technology integration is visible in my school.	.676**	1
	78	Over half of our school faculty integrates technology on a regular basis	.562**	1
	78	Teachers in my school help each other with technology integration needs and ideas.	.541**	2
	78	Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	.527**	1
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.500**	2
	78	I have opportunities to observe other teachers integrating technology in their classrooms.	.453**	1
	77	Student work involving technology integration is often printed and hung in the hallways of my school.	.449**	1
	78	Other teachers on my grade level support me with technology integration needs and ideas.	.433**	2
	78	I have access to many technology resources which can be checked out from our school media center.	.422**	1
	78	Technology integration is often part of local school staff development.	.417**	1
	78	When I have a technology related question, I can quickly find someone in my school to help me with the question.	.388**	2
	76	I have opportunities to try new technology in my school.	.362**	1
	78	I have resources in my school (web page, software help, etc.) which cut down on the time I need to plan technology integrated lessons.	.344**	1
	78	In addition to county staff development opportunities, my school offers technology related staff development.	.323*	1
	78	I have the time I need to plan technology integrated lessons.	.295**	1
	78	When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	.286*	1
	78	Technology staff development I receive helps simplify technology integration for me.	.285*	1
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.279*	1
	78	The leaders (administrators, etc) demonstrate use of technology when presenting to the faculty at my school.	.225*	1

** .01 level, *.05 level (2-tailed)

Table 34 shows the 18 items correlated with the statement *Over half of our school faculty integrates technology on a regular basis*, with which 72.2% of respondents agreed or strongly agreed. The highest correlated item was the availability of fellow teachers to

model how to use software and hardware. Access to peer and technology personnel support and elements of diffusion were all present in correlations with a large percentage of faculty integrating technology.

Table 34

Correlations with Majority of Faculty Integrating Technology

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
Over half of our school faculty integrates technology on a regular basis.	78	Fellow teachers are available to model how to use software applications and/or hardware at my school.	.562**	1
	78	Teachers in my school help each other with technology integration needs and ideas.	.497**	2
	78	I have access to many technology resources which can be checked out from our school media center.	.488**	1
	78	Technology integration is visible in my school.	.484**	1
	78	Technology integration is often part of local school staff development.	.473**	1
	78	Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	.444**	1
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.443**	2
	78	I have opportunities to observe other teachers integrating technology in their classrooms.	.442**	1
	76	I have opportunities to try new technology in my school.	.403**	1
	77	Student work involving technology integration is often printed and hung in the hallways of my school.	.357**	1
	78	In addition to county staff development opportunities, my school offers technology related staff development.	.356**	1
	78	Other teachers on my grade level support me with technology integration needs and ideas.	.330**	2
	78	I have resources in my school (web page, software help, etc.) which cut down on the time I need to plan technology integrated lessons.	.307**	1
	78	I have access to many technology resources within my classroom.	.290**	1
	78	When I have a technology related question, I can quickly find someone in my school to help me with the question.	.284*	2
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.261*	1
	78	When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	.232*	1
	78	I have the opportunity to go to technology related conferences to see technology demonstrated.	.227*	1

Table 35 shows the 19 items correlated with the statement *I have opportunities to observe other teachers integrating technology in their classrooms*, with which 45.5% disagreed or strongly disagreed and 40.6% agreed or strongly agreed. Access to peer and technology personnel support correlated with having opportunities to observe other teachers integrating technology. A negative correlation was found between opportunities to observe other teachers integrating technology and the desire to have someone demonstrate technology rich lessons within one's own classroom. Negative correlations were also found between opportunities to observe other teachers integrating technology and a feeling of frustration with the complexity of technology and a feeling that technology staff development moves too fast. This could indicate that the ability to observe others integrate technology decreases frustration with technology staff development and meets teachers' needs to have someone else model technology integration. Elements of diffusion were also present throughout the correlations with opportunities to observe other teachers integrate technology.

Table 35

Correlations with Opportunities to Observe Fellow Teachers Integrating Technology

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I have opportunities to observe other teachers integrating technology in their classrooms.	78	Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	.489**	1
	78	In addition to county staff development opportunities, my school offers technology related staff development.	.463**	1
	78	Fellow teachers are available to model how to use software applications and/or hardware at my school.	.453**	1
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.451**	1
	78	Over half of our school faculty integrates technology on a regular basis.	.442**	1
	78	Teachers in my school help each other with technology integration needs and ideas.	.434**	2
	78	Technology integration is often part of local school staff development.	.430**	1
	78	I have the time I need to plan technology integrated lessons.	.383**	1
	77	Student work involving technology integration is often printed and hung in the hallways of my school.	.375**	1
	78	I have access to many technology resources which can be checked out from our school media center.	.348**	1
	78	Technology staff development I receive helps simplify technology integration for me.	.347**	1
	78	Technology integration is visible in my school.	.347**	1
	78	When I have a technology related question, I can quickly find someone in my school to help me with the question.	.315**	2
	78	I have access to many technology resources within my classroom.	.313**	1
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.306**	2
	78	I have the time I need to learn new technology skills.	.282*	1
	77	I feel that technology related staff development often moves too fast for me to learn the skills which I need.	-.234*	1
	78	I wish I had someone to come to my classroom to demonstrate technology rich lessons.	-.252*	2
	78	I feel frustrated by the complexity of technology when I participate in technology staff development.	-.349**	1

** .01 level, *.05 level (2-tailed)

Table 36 shows the 19 items correlated with the statement *Student work involving technology integration is often printed and hung in the hallways of my school*, with which 62.8% of respondents agreed or strongly agreed. Access to peer and technology personnel support correlates with student work involving technology being displayed throughout the school. Elements of diffusion were also present in the correlations.

Table 36

Correlations with Student Work Involving Technology Displayed

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
Student work involving technology integration is often printed and hung in the hallways of my school.	77	Technology integration is visible in my school.	.537**	1
	77	I have access to many technology resources which can be checked out from our school media center.	.479**	1
	77	In addition to county staff development opportunities, my school offers technology related staff development.	.464**	1
	77	Fellow teachers are available to model how to use software applications and/or hardware at my school.	.449**	1
	77	Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	.448**	1
	77	Teachers in my school help each other with technology integration needs and ideas.	.420**	2
	76	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.406**	1
	77	Technology staff development I receive helps simplify technology integration for me.	.400**	1
	77	I have opportunities to observe other teachers integrating technology in their classrooms.	.375**	1
	77	Over half of our school faculty integrates technology on a regular basis.	.357**	1
	77	Other teachers on my grade level support me with technology integration needs and ideas.	.323**	2
	77	I have resources in my school (web page, software help, etc.) which cut down on the time I need to plan technology integrated lessons.	.310**	1
	77	I have the time I need to learn new technology skills.	.296**	1
	77	Technology integration is often part of local school staff development.	.295**	1
	76	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.273*	2
	77	I have the time I need to plan technology integrated lessons.	.263*	1
	77	I have access to many technology resources within my classroom.	.261*	1
	76	When I e-mail a technology support person, I get a response quickly.	.235*	2
	77	The leaders (administrators, etc) demonstrate use of technology when presenting to the faculty at my school.	.227*	1

Table 37 shows the 11 items correlated with the statement *I have the opportunity to go to technology related conferences to see technology demonstrated,* with 51.9% of respondents agreeing or strongly agreeing with this statement. A negative correlation that appeared between opportunities to go to technology related conferences and the desire to have someone come to one's classroom to demonstrate technology lessons indicated that this need may be fulfilled by seeing demonstrations at conferences. Elements of relative advantage, compatibility, and observability were also present in the correlations.

Table 37

Correlations with Opportunities to Attend Technology Conferences

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I have the opportunity to go to technology related conferences to see technology demonstrated.	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.391**	1
	78	I have resources in my school (web page, software help, etc.) which cut down on the time I need to plan technology integrated lessons.	.374**	1
	78	Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	.358**	1
	78	I have the time I need to learn new technology skills.	.333**	1
	78	Technology staff development I participate in matches my teaching philosophy.	.315**	1
	78	I have access to many technology resources which can be checked out from our school media center.	.271*	1
	78	Technology staff development I receive helps simplify technology integration for me.	.266*	1
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.255*	2
	78	Technology integration is visible in my school.	.234*	1
	78	Over half of our school faculty integrates technology on a regular basis.	.227*	1
	78	I wish I had someone to come to my classroom to demonstrate technology rich lessons.	-.375**	2

** .01 level, *.05 level (2-tailed)

Observability Qualitative Analysis

Observability is present in this staff development program. Observability of technology during attendance at technology conferences appeared to lead to a desire to apply what was observed in the classroom. Also, it appears from the interviews, that many of the teachers who signed up for the second round of the program did so because they were able to observe the impact of the technology in other participants' classrooms in their school. The following open ended responses from the online survey indicate observability.

> I am being exposed to some new technology I had not had the opportunity to use before.
>
> It has been very beneficial when we share what we have done with each other. It has generated many ideas for me.

One of the interview questions directly related to the element of observability. All interviewees felt that teachers having the opportunity to see what they were doing in their classroom with technology or listen to conversations in the teachers' lunchroom increased teachers desire to sign up for the second round of this professional development opportunity.

> I know quite a few have signed up for next year here to do [program name]. We only had 8 this year I believe at our school. So it was minimal, but we have at least double that who want to do it just from seeing the kids all excited. (Interview 8)
>
> We have 19 new ones [signed up for year two]. We had a lot of teachers sign up which is good because obviously they have seen the ones doing it now and have seen how enthusiastic we are about it. (Interview 6)

Web log entries also support these findings and show that observability at the grade level and at technology conferences helped them to have new ideas.

> I attended the GA Educational Technology Conference on the 16th and wish I could have gone all week. It was awesome!!!! I took two classes. I was looking forward to them, but didn't think that I would be sitting there feeling wowed by everything I heard. I was so wrong. The Google class was first. I had no idea that Google offered so much that would be of use to me as a teacher. It really does. A three hour class was not long enough to learn everything we needed to know. It was unbelievable. The next class that I went to was a Movie Maker class. I just took the Movie Maker [Name of Program] class and I still learned a ton from this extra class that I didn't already know. I hope I get the chance to go again next year. What a great experience. (Web log 6)

One teacher of the 71 online survey respondents who answered the open ended questions expressed concern in the area of observability because she was one of two teachers at her school participating in the program and did not have opportunities to see what other teachers were doing to integrate technology.

> Because I am one of 2 teachers in my school doing [program name], there are no opportunities for me to see other people integrating technology.

Triability Quantitative Analysis

Triability is the ability to experiment with a new innovation (Rogers, 1995). Table 38 shows the items from the online survey that are associated with triability. Over 90% of respondents agreed or strongly agreed they had opportunities to try new technology at their school and had access to technology resources within their classroom. Over half of all respondents agreed or strongly agreed that they had opportunities to go to demonstrations of new technology in which they could try it out for themselves and had access to technology resources that could be checked out from the school media center.

Table 38

Triability Survey Item Frequencies

	N	*Strongly Disagree*	*Disagree*	*Undecided*	*Agree*	*Strongly Agree*
I have opportunities to try new technology in my school.	77	3.9% (3)	0% (0)	1.3% (1)	40.3% (31)	54.5% (42)
I have access to many technology resources within my classroom.	79	1.3% (1)	0 (0)	3.8% (3)	39.2% (31)	55.7% (44)
I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	78	5.1% (4)	28.2% (22)	12.8% (10)	34.6% (27)	19.2% (15)
I have access to many technology resources which can be checked out from our school media center.	79	3.8% (3)	12.7% (10)	21.5% (17)	46.8% (37)	15.2% (12)

Table 39 shows the 20 items correlated with the statement *I have opportunities to try new technology in my school*, with which 94.8% of respondents agreed or strongly agreed. The item most highly correlated to this statement is access to resources that can be checked out from the school media center. Thirteen other items in the area of elements of diffusion also correlated with opportunities to try new technology within the school. A negative correlation was found between opportunities to try new technologies and a feeling that technology staff development is repetitive and does not offer a chance to learn new technology. A positive correlation in the area of classroom impact is apparent between opportunities to try new technology and staff development motivating teachers to integrate technology. Teachers helping each other and access to technology support whenever needed both show positive correlations to opportunities to try new technology in the area of support. A negative correlation in the area of support is apparent between opportunities to try new technology and the desire to have more support because of frustration with technology.

Table 39

Correlations with Opportunity to Try New Technology

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I have opportunities to try new technology in my school.	76	I have access to many technology resources which can be checked out from our school media center.	.407**	1
	76	Over half of our school faculty integrates technology on a regular basis.	.403**	1
	76	Technology integration is often part of local school staff development.	.381**	1
	76	Technology integration is visible in my school.	.369**	1
	76	Teachers in my school help each other with technology integration needs and ideas.	.366**	2
	76	Fellow teachers are available to model how to use software applications and/or hardware at my school.	.362**	1
	76	I have the time I need to learn new technology skills.	.320**	1
	76	District technology integration training I have participated in has been effective in motivating me to integrate technology.	.318**	3
	75	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.317**	1
	76	Technology staff development I receive helps simplify technology integration for me.	.304**	1
	76	I have access to many technology resources within my classroom.	.290*	1
	76	Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	.281*	1
	76	I feel technology related staff development motivates me to integrate technology in my classroom	.276*	3
	75	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.270*	2
	76	Other teachers on my grade level support me with technology integration needs and ideas.	.256*	2
	76	District technology integration I have participated in has been effective in teaching me skills needed to integrate technology.	.237*	3
	76	The leaders (administrators, etc) demonstrate use of technology when presenting to the faculty at my school.	.229*	1
	76	I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school	.226*	1
	76	I feel technology related staff development is repetitive and does not offer opportunities to learn new programs	-.272*	1
	75	I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively	-.289*	2

** .01 level, *.05 level (2-tailed)

Table 40 shows the 22 items correlated with the statement *I have access to many technology resources within my classroom*, with which 94.9% of respondents agreed or

strongly agreed. The item most highly correlated to this statement is district technology integration has been effective in teaching me skills needed to integrate technology. In addition to this item related to impact, a positive correlation is also seen between access to resources and effectiveness of staff development in motivating teachers to integrate technology. These correlations indicate access to resources as an important aspect in motivating teachers to integrate technology and their ability to learn necessary skills. Access to peer and technology personnel support also correlated with access to resources. A negative correlation was found in the area of support between access to resources within one's classroom and desire to have support personnel come to one's classroom to model lessons and a desire for more support because of frustration with technology. All elements of diffusion were present in the correlations with access to resources. In particular, a negative correlation was observed between access to technology resources within one's classroom and a feeling of frustration with the complexity of technology.

Table 40

Correlations with Access to Many Resources

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I have access to many technology resources within my classroom.	78	District technology integration I have participated in has been effective in teaching me skills needed to integrate technology.	.408**	3
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.380**	1
	78	I know the names of the technology support people who serve my school.	.330**	2
	78	Teachers in my school help each other with technology integration needs and ideas.	.321**	2
	78	I have opportunities to observe other teachers integrating technology in their classrooms.	.313**	1
	78	Over half of our school faculty integrates technology on a regular basis.	.290**	1
	76	I have opportunities to try new technology in my school.	.290*	1
	78	Technology integration is visible in my school.	.289*	1
	78	When I have a technology related question, I can quickly find someone in my school to help me with the question.	.274*	2
	78	District technology integration training I have participated in has been effective in motivating me to integrate technology.	.272*	3
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.264*	2
	77	Student work involving technology integration is often printed and hung in the hallways of my school.	.261*	1
	78	Other teachers on my grade level support me with technology integration needs and ideas.	.251*	2
	78	I have access to many technology resources which can be checked out from our school media center.	.248*	1
	78	I have the time I need to learn new technology skills.	.240*	1
	78	When I receive technology related support, the people giving support are patient and do not make me feel inferior for not knowing how to do something.	.235*	2
	78	Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	.234*	1
	78	Technology staff development I receive helps simplify technology integration for me.	.234*	1
	78	Technology integration is often part of local school staff development.	.327**	1
	78	I feel frustrated by the complexity of technology when I participate in technology staff development.	-.300**	1
	77	I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively	-.251*	2
	78	I wish I had someone to come to my classroom to demonstrate technology rich lessons.	-.285*	2

** .01 level, *.05 level (2-tailed)

Table 41 shows the 29 items correlated with the statement *I have the opportunity to go to demonstrations of new technology where I can try it out for myself*, with 53.8%

of respondents agreeing or strongly agreeing. In the area of classroom impact, district technology staff development effectiveness in teaching teachers the skills needed to integrate technology positively correlated with opportunities to go to demonstrations where teachers can try new technologies. Six correlated items fall under the area of support. A negative correlation was apparent between a feeling of frustration with technology and a desire for more support and desire for someone to demonstrate technology lessons within one's classroom, and the opportunity to go to demonstrations of new technology. The remaining 22 correlated items are related to elements of diffusion. A negative correlation was found between opportunity to go to demonstrations of new technology and a feeling of frustration with the complexity of technology, indicating that the ability to observe others demonstrate technology may make technology less complex.

Table 41

Correlations with Opportunity to Attend Demonstrations

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	77	When I have a technology related question, I can find someone in my school to help me with the question.	.497**	1
	77	Technology integration is often part of local school staff development.	.477**	1
	77	I have the time I need to plan technology integrated lessons.	.472**	1
	77	Other teachers on my grade level support me with technology integration needs and ideas.	.452**	2
	77	I have opportunities to observe other teachers integrating technology in their classrooms.	.451**	1
	77	Teachers in my school help each other with technology integration needs and ideas.	.425**	2
	77	Technology integration is visible in my school.	.410**	1
	76	Student work involving technology integration is often printed and hung in the hallways of my school.	.406**	1
	77	Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	.400**	1
	77	I have the opportunity to go to technology related conferences to see technology demonstrated.	.391**	1
	77	Technology staff development I receive helps simplify technology integration for me.	.389*	1
	77	I have access to many technology resources within my classroom.	.380**	1
	77	In addition to county staff development opportunities, my school offers technology related staff development.	.377**	1
	77	The leaders (administrators, etc) demonstrate use of technology when presenting to the faculty at my school.	.375**	1
	77	I have the time I need to learn new technology skills.	.356**	1
	77	I have access to many technology resources which can be checked out from our school media center.	.343**	1
	77	When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	.335**	1
	76	I feel supported with technology integration even after a technology staff development opportunity has ended.	.321**	2
	75	I have opportunities to try new technology in my school.	.317**	1
	77	I have resources in my school (web page, software help, etc.) which cut down on the time I need to plan technology integrated lessons.	.288*	1
	77	Fellow teachers are available to model how to use software applications and/or hardware at my school.	.279*	1
	76	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.278*	2
	77	District technology integration I have participated in has been effective in teaching me skills needed to integrate technology.	.267*	3
	77	Over half of our school faculty integrates technology on a regular basis.	.261*	1
	77	I have observed a fellow teacher teaching a technology integrated lesson	.249*	1
	77	I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school	.226*	1
	77	I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively	-.308**	2
	77	I wish I had someone to come to my classroom to demonstrate technology rich lessons.	-.331**	2
	77	I feel frustrated by the complexity of technology when I participate in technology staff development.	-.362**	1

** .01 level, *.05 level (2-tailed)

Table 42 shows the 24 items correlated with the statement *I have access to many technology resources which can be checked out from our school media center*, with which 62% or respondents agreed or strongly agreed. Technology integration being visible within the school had the highest correlation with having access to many technology resources that can be checked out from the school media center. Eighteen items deal with elements of diffusion. Three items in the area of support positively correlated with access to resources that can be checked out from the school media center. In addition, having access to resources that can be checked out from the school media center correlated with statements indicating impact on classroom instruction. Frequently using technology that is learned in staff development correlated positively and a feeling of inability to apply what is learned in technology driven staff development in one's classroom was correlated negatively with access to resources that can be checked out from the media center.

Table 42

Correlations with Access to Media Center Resources

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I have access to many technology resources which can be checked out from our school media center.	78	Technology integration is visible in my school.	.602**	1
	78	I have resources in my school (web page, software help, etc.) which cut down on the time I need to plan technology integrated lessons.	.569**	1
	78	Teachers in my school help each other with technology integration needs and ideas.	.545**	2
	78	Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	.514**	1
	78	Over half of our school faculty integrates technology on a regular basis	.488**	1
	77	Student work involving technology integration is often printed and hung in the hallways of my school.	.479**	1
	78	Technology integration is often part of local school staff development.	.442**	1
	78	The leaders (administrators, etc) demonstrate use of technology when presenting to the faculty at my school.	.426**	1
	78	Fellow teachers are available to model how to use software applications and/or hardware at my school.	.422**	1
	78	Other teachers on my grade level support me with technology integration needs and ideas.	.419**	2
	76	I have opportunities to try new technology in my school.	.407**	1
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.380**	2
	78	I have opportunities to observe other teachers integrating technology in their classrooms.	.348**	1
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.343**	1
	78	I have the time I need to learn new technology skills.	.341**	1
	78	I have the time I need to plan technology integrated lessons.	.325**	1
	78	In addition to county staff development opportunities, my school offers technology related staff development.	.319**	1
	78	When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	.304**	1
	77	I frequently use technology ideas which I learned in a technology staff development class.	.301**	3
	78	I have the opportunity to go to technology related conferences to see technology demonstrated.	.271*	1
	78	I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school	.260*	1
	78	I have access to many technology resources within my classroom.	.248*	1
	78	Technology staff development I receive helps simplify technology integration for me.	.243	1
	77	I often am excited about technology when I take technology related staff development, but am not able to take what I learn in the staff development and apply it to my classroom.	-.246*	3

** .01 level, *.05 level (2-tailed)

Triability Qaulitative Analysis

Triability was present in this staff development program. Teachers appreciated the hands-on nature of the program and expressed that this allowed them to try out the new technology. The following quotations from the online open ended responses provide a sampling of how the staff development program provided an element of triability.

> This has been one of the first staff development programs that I have been through in which the materials that I have needed have been readily available immediately to implement the new ideas.
>
> It helps having the technology in our classroom to get familiar with before taking the classes.
>
> I have been given all the tools to work with and try out all of the new technology I am using.
>
> A continuous learning experience. A way to explore the new technologies available, and to find new ways to implement them.
>
> I have time each week to work on what I learned in class and then ask questions from the instructor the next week in class if I don't understand something.

The hands-on, triable, nature of the program was also evident in the interview responses. The ability to try out new technology within one's classroom while learning new skills in classes appears to help the staff development be more effective.

> It is very hands-on – when you go to the training you get to try everything and you get to work it out. If you are working on a certain program you are actually on the computer working on that program instead of just listening to somebody or watching a presentation you really get to be part of it. (Interview 1)
>
> In the staff development you get a lot of one on one support from the instructor. She can just come and sit next to you if you have a problem. You have a lot of time to experience and experiment with the technology you are being exposed to. (Interview 4)

Summary Question One

Qualitative and quantitative data indicated all five elements of diffusion were present in this staff development initiative. In the areas of relative advantage and compatibility, quantitative data indicated teachers enjoyed the staff development experience, thought the staff development experienced matched with their teaching philosophy, felt they were learning something new, had access to many technology resources, thought administration demonstrated use of technology, and felt that any problems were fixed quickly. Qualitative data triangulated well with the quantitative data and indicated teachers felt what they were learning was applicable and transferable to the classroom. Teachers were appreciative of all the equipment and access to support staff that was given them and felt this made the program more successful than previous technology staff development programs in which they had participated. In the area of complexity, quantitative data showed the staff development initiative helped simplify technology and most respondents disagreed with the statement that technology staff development moved too fast. Qualitative data supported quantitative data with teachers stating that the technology resources and staff development provided them made teaching easier. Teachers stated that having access to the equipment before taking classes allowed them to utilize what they were learning from the start so they did not forget what was covered in the classes. In addition, having the equipment permanently set up, prompted teachers to use technology more frequently because the process of using the technology was less complex. In the area of observability, quantitative data indicated that technology and student work involving technology were visible in the schools. Teachers also noted the visibility of other teachers using technology (table 31). Qualitative data was

consistent with quantitative data indicating high observability within the initiative. Teachers indicated that sharing work and ideas with peers was beneficial and that they had opportunities to be exposed to various types of technologies both within the school district and through conference attendance. Interviewees felt that many teachers who signed up for the second session of the staff development initiative did so because they were able to observe the benefits of the technology in other teachers' classrooms. The last element of diffusion is triability, and teachers indicated they had opportunities to try new technology in both quantitative and qualitative data sources. Quantitative data indicated teachers had opportunities to try new technology and access to many resources to try in their classroom. Qualitative data indicated teachers like the hands on nature of the program. Data also indicated that teachers liked that they could try the new technology out during class instructional time, receiving assistance if needed, and could immediately try out what they were learning in the classroom. Correlations throughout the five elements indicated ties among elements of diffusion, support, and impact on classroom technology integration. Correlations also indicated interrelatedness among items associated with elements of diffusion. Correlations suggest interrelatedness among all parts of the study, showing that technology staff development is multifaceted.

Question Two:

How do Teachers Experience Instructional Technology Support and the Impact of Support on Their Technology Integration Instruction?

Question two deals with how teachers experience instructional technology support during the staff development program and what impact this support has on their technology integration within their classrooms. Eleven questions were added to the online

survey in order to examine level of support received by teachers. Two of the questions specifically mentioned support from fellow teachers, three specifically mentioned support related to a technology support person, and the other six were questions about support in general. Other factors, not classified as support factors also correlate with the support as seen by the following correlation tables. Qualitative data were related to this research question and collected via open ended questions on the online survey, teacher interviews, and teacher web logs.

Support Quantitative Analysis

Over 90% of respondents to the online survey reported they knew the names of technology support personnel, people giving support did not make them feel inferior for not already knowing how to do something, and email to support personnel is answered quickly. Over 85% of respondents reported having access to technology related support whenever needed, to support even after a technology related staff development has ended, and to fellow teachers who support each other with technology integration needs and ideas. Close to 75% of respondents reported that other teachers on their grade level supported them in their use of technology and that they had quick access to people in the school who can answer technology related questions. The majority of teachers felt support at an adequate or more than adequate level with 80.7% disagreeing or strongly disagreeing with the statement, *I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively*. Even with such a high level of support, 71.8% responded that they felt that a technology support person who could visit their classroom when needed and help them with integrating new software for the first time would make them more likely to integrate technology. Slightly over half of respondents wished they had someone to come to their classroom to demonstrate technology rich lessons. Table 43 shows these results.

Table 43

Support Survey Item Frequencies

	N	*Strongly Disagree*	*Disagree*	*Undecided*	*Agree*	*Strongly Agree*
I feel supported with technology integration even after a technology staff development opportunity has ended.	78	2.6% (2)	3.8% (3)	6.4% (5)	56.4% (44)	30.8% (24)
I feel a technology support person who could visit my classroom when needed and help me with integrating new software for the first time would make me more likely to integrate technology.	78	1.3% (1)	14.1% (11)	12.8% (10)	39.7% (31)	32.1% (25)
I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively.	78	33.3% (26)	47.4% (37)	3.8% (3)	11.5% (9)	3.8% (3)
When I have a technology related question, I can quickly find someone in my school to help me with my question.	79	3.8% (3)	15.2% (12)	5.1% (4)	44.3% (35)	31.6% (25)
I wish I had someone to come to my classroom to demonstrate technology rich lessons.	79	7.6% (6)	12.7% (10)	25.3% (20)	32.9% (26)	21.5% (17)
I know the names of the technology support people who serve my school.	79	0 (0)	1.3% (1)	0 (0)	24.1% (19)	74.7% (59)
When I receive technology related support, the people giving support are patient and do not make me feel dumb for not knowing how to do something.	79	1.3% (1)	1.3% (1)	2.5% (2)	26.6% (21)	68.4% (54)
When I e-mail a technology support person, I get a response quickly.	78	1.3% (1)	2.6% (2)	1.3% (1)	34.6% (27)	60.3% (47)
Other teachers on my grade level support me with technology integration needs and ideas.	79	2.5% (2)	6.3% (5)	16.5% (13)	51.9% (41)	22.8% (18)
Teachers in my school help each other with technology integration needs and ideas.	79	0 (0)	6.3% (5)	6.3% (5)	59.5% (47)	27.8% (22)
I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	78	0 (0)	9.0% (7)	3.8% (3)	60.3% (47)	26.9% (21)

Table 44 shows the seven positive and one negative items correlated with the statement *I feel supported with technology integration even after a technology staff development opportunity has ended*, with which 87.2% of respondents agreed or strongly agreed. The item most highly correlated with this statement deals with frequently using

technology ideas learned in staff development, suggesting a link between support and classroom implementation of staff development learning. The one negative correlation suggests that the more supported teachers feel, the less likely they are to feel frustrated and desire more support. The remaining correlations deal with elements of diffusion. These correlations indicate consistency in the survey responses.

Table 44

Correlations with Feeling of on-going Support

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I feel supported with technology integration even after a technology staff development opportunity has ended.	77	I frequently use technology ideas which I learned in a technology staff development class	.413**	3
	77	Technology integration is often part of local school staff development.	.331**	1
	76	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.321**	1
	77	The leaders (administrators, etc) demonstrate use of technology when presenting to the faculty at my school.	.311**	1
	77	Technology staff development I receive helps simplify technology integration for me.	.274*	1
	77	Technology integration is visible in my school.	.234*	1
	77	I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school	.225*	1
	76	I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively	-.283*	2

** .01 level, *.05 level (2-tailed)

Table 45 shows the 31 items correlated with the statement *I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom*, with which 71.8% of respondents agreed or strongly agreed. The correlations aspect of this study examined 41 survey items, so this one statement correlates with over 75% of all other survey statements examined via correlations. It appears that a feeling of access to technology integration support whenever needed is

important in an effective technology staff development program. Six of the correlations are with other support related survey items. Two of the four negative correlations with access to support are support related, i.e., a negative correlation with a desire to have someone demonstrate technology lessons within one's classroom and frustration with technology and desire for additional support. One positive correlation and one negative correlation appear in the area of impact of staff development on teachers' technology integration. There is a positive correlation with change in teaching philosophy and a negative correlation with the inability to apply in the classroom things learned in staff development. The remaining 23 correlations deal with elements of diffusion. A negative correlation exists between access to support and feeling frustrated by the complexity of technology presented in staff development. The remaining 22 correlations are positive correlations with elements of diffusion.

Table 45

Correlations with Access to Support Whenever Needed

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	77	Teachers in my school help each other with technology integration needs and ideas.	.679**	2
	77	When I have a technology related question, I can find someone in my school to help me with the question.	.550**	2
	77	Technology integration is visible in my school.	.524**	1
	77	When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	.514**	1
	77	Fellow teachers are available to model how to use software applications and/or hardware at my school.	.500**	1
	77	Over half of our school faculty integrates technology on a regular basis.	.443**	1
	76	When I e-mail a technology support person, I get a response quickly.	.436**	2
	77	I have the time I need to learn new technology skills.	.432**	1
	77	I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school	.385**	1
	77	I have access to many technology resources which can be checked out from our school media center.	.380**	1
	77	Other teachers on my grade level support me with technology integration needs and ideas.	.375**	2
	77	I have the time I need to plan technology integrated lessons.	.370**	1
	77	Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	.333**	1
	77	I have opportunities to observe other teachers integrating technology in their classrooms.	.306**	1
	76	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.278*	1
	76	Student work involving technology integration is often printed and hung in the hallways of my school.	.273*	1
	77	My teaching philosophy has changed because of technology related staff development.	.272*	3
	75	I have opportunities to try new technology in my school.	.270*	1
	77	Technology integration is often part of local school staff development.	.268*	1
	77	Technology staff development I participate in matches my teaching philosophy.	.268*	1
	77	I have access to many technology resources within my classroom.	.264*	1
	77	Technology staff development I receive helps simplify technology integration for me.	.262*	1
	77	I have the opportunity to go to technology related conferences to see technology demonstrated.	.255*	1
	77	I have resources in my school (web page, software help, etc.) which cut down on the time I need to plan technology integrated lessons.	.251*	1
	77	In addition to county staff development opportunities, my school offers technology related staff development.	.242*	1
	77	I know the names of the technology support people who serve my school.	.240*	2
	77	District technology integration I have participated in has been effective in teaching me skills needed to integrate technology.	.236*	1
	76	I often am excited about technology when I take technology related staff development, but am not able to take what I learn in the staff development and apply it to my classroom	-.228*	3
	76	I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively	-.279*	2
	77	I feel frustrated by the complexity of technology when I participate in technology staff development.	-.290*	1
	77	I wish I had someone to come to my classroom to demonstrate technology rich lessons.	-.306**	2

** .01 level, *.05 level (2-tailed)

Table 46 shows the three items which correlate to the statement *I feel a technology support person who could visit my classroom when needed and help me with*

integrating new software for the first time would make me more likely to integrate technology, with which 71.8% of respondents agreed or strongly agreed. One positive correlation dealt with the area of support and indicated a desire for someone to demonstrate technology lessons within one's classroom. The remaining two correlations, one positive and one negative, deal with elements of diffusion, a positive correlation between a feeling of frustration with the complexity of technology and a negative correlation with having the time needed to learn new technology skills.

Table 46

Correlations with Desire for in Classroom Modeling when Needed

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I feel a technology support person who could visit my classroom when needed and help me with integrating new software for the first time would make me more likely to integrate technology.	77	I wish I had someone to come to my classroom to demonstrate technology rich lessons.	.408**	2
	77	I feel frustrated by the complexity of technology when I participate in technology staff development.	.281*	1
	77	I have the time I need to learn new technology skills.	-.234*	1

** .01 level, *.05 level (2-tailed)

Table 47 shows the 18 items which correlate with the statement *I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively*, with which 80.7% of respondents disagreed or strongly disagreed. The two positive correlations indicate frustration with the complexity of technology and a desire for someone to model technology lessons. Items indicating access to resources and support negatively correlate with a feeling of frustration and desire for more support suggesting that support and access to resources can help minimize frustration. It is also important to note that feeling frustrated and desiring more support negatively correlates with frequently using technology ideas learned in class and a match between teaching philosophy and staff development.

Table 47

Correlations with Feeling of Frustration/Desire for More Support

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively.	77	I feel frustrated by the complexity of technology when I participate in technology staff development.	.501**	1
	76	I wish I had someone to come to my classroom to demonstrate technology rich lessons.	.449**	2
	77	I have the time I need to plan technology integrated lessons.	-.225*	1
	77	I have access to many technology resources within my classroom.	-.251*	1
	76	When I e-mail a technology support person, I get a response quickly.	-.262*	2
	77	District technology integration training I have participated in has been effective in motivating me to integrate technology.	-.266*	3
	77	I frequently use technology ideas which I learned in a technology staff development class	-.275*	3
	76	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	-.279*	2
	76	I feel supported with technology integration even after a technology staff development opportunity has ended.	-.283*	2
	75	I have opportunities to try new technology in my school.	-.289*	1
	77	District technology integration I have participated in has been effective in teaching me skills needed to integrate technology.	-.297**	3
	77	Technology staff development I participate in matches my teaching philosophy.	-.305**	1
	76	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	-.308**	1
	77	I know the names of the technology support people who serve my school.	-.330**	2
	77	When I have a technology related question I can quickly find someone	-.371**	2
	77	I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school	-.375**	1
	77	When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	-.393**	1
	77	I have the time I need to learn new technology skills.	-.437**	1

** .01 level, *.05 level (2-tailed)

Table 48 shows the 17 items which correlate with the statement *I wish I had someone to come to my classroom to demonstrate technology rich lessons*, with which 54.4% of respondents agreed or strongly agreed. Four of the 17 correlations were positive. In the area of impact on classroom practice, a negative correlation is apparent between a desire for someone to come to one's classroom to demonstrate technology rich lessons and the thought that district staff development has been effective in teaching the skills necessary for integrating technology. Two positive correlations and three negative correlations deal with support. Positive correlations were found between the desire to have someone come to one's classroom to demonstrate technology lessons and a feeling of frustration and desire for more support. Negative correlations were found between a desire for someone to demonstrate technology lessons within one's own classroom and teachers helping each other with ideas and skills and access to support whenever needed. The rest of the correlations dealt with elements of diffusion. Complexity was apparent in positive correlations. Relative advantage, compatibility, and observability were all present in negative correlations.

Table 48

Correlations with Desire for Classroom Modeling

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I wish I had someone to come to my classroom to demonstrate technology rich lessons.	77	I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively	.449**	2
	78	I feel frustrated by the complexity of technology when I participate in technology staff development.	.442**	1
	77	Staff development moves too fast for me to learn the skills I need to learn.	.423**	1
	77	I feel a technology support person who could visit my classroom when needed and help me with integrating new software for the first time would make me more likely to integrate technology	.408**	2
	78	Teachers in my school help each other with technology integration needs and ideas.	-.241*	2
	78	District technology integration I have participated in has been effective in teaching me skills needed to integrate technology.	-.248*	3
	78	I have opportunities to observe other teachers integrating technology in their classrooms.	-.252*	1
	78	I have observed a fellow teacher teaching a technology integrated lesson	-.270*	1
	78	I have access to many technology resources within my classroom.	-.285*	1
	78	When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	-.295**	1
	78	I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school	-.298**	1
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	-.306**	2
	78	When I have a technology related question, I can quickly find someone in my school to help me with the question.	-.327**	2
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	-.331**	1
	78	I have the opportunity to go to technology related conferences to see technology demonstrated.	-.375**	1
	78	I have the time I need to learn new technology skills.	-.398**	1
	78	I have the time I need to plan technology integrated lessons.	-.452**	1

** .01 level, *.05 level (2-tailed)

Table 49 shows the 12 items that correlate with the statement *I know the names of the technology support people who serve my school*, with which 98.8% or respondents agreed or strongly agreed. Three items positively correlated with this statement in the area of impact on classroom teaching indicating a link between a relationship with support personnel and impact of staff development. One negative correlation between knowing the names of technology support personnel and a feeling of frustration and desire for more support was apparent. Relative advantage and compatibility were apparent in positive correlations. A negative correlation between a feeling that staff development moves too fast to learn necessary skills and knowing the names of technology support personnel was also evident.

Table 49

Correlations with Knowing the Names of Support Personnel

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I know the names of the technology support people who serve my school.	77	When I e-mail a technology support person, I get a response quickly.	.630**	2
	78	When I receive technology related support, the people giving support are patient and do not make me feel inferior for not knowing how to do something.	.602**	2
	78	I have access to many technology resources within my classroom.	.330**	1
	78	District technology integration training I have participated in has been effective in motivating me to integrate technology.	.326**	3
	78	When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	.284*	1
	78	Technology staff development I participate in matches my teaching philosophy.	.264*	1
	78	District technology integration I have participated in has been effective in teaching me skills needed to integrate technology.	.259*	3
	78	Teachers in my school help each other with technology integration needs and ideas.	.249*	2
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.240*	2
	78	My teaching philosophy has changed because of technology related staff development.	.224*	3
	77	Staff development moves too fast for me to learn the skills I need to learn.	-.229*	1
	77	I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively	-.330**	2

** .01 level, *.05 level (2-tailed)

Table 50 shows the 19 items correlated with the statement *When I have a technology related question, I can quickly find someone in my school to help me with the question,* with which 75.9% of respondents agreed or strongly agreed. All of the correlations with this statement deal with elements of diffusion or support. The item most highly correlated with this statement was quick repair of technology which is not working properly. Negative correlations were found with a feeling of frustration with technology related staff development and desire for more support. Access to peer and technology

personnel support was also positively correlated. Relative advantage, compatibility, and observability were present in positive correlations and complexity was present in one negative correlation.

Table 50

Correlations with Access to others who can help with Questions

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
When I have a technology related question, I can quickly find someone in my school to help me with the question.	78	When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	.602*	1
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.550**	2
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.497**	1
	77	When I e-mail a technology support person, I get a response quickly.	.425**	2
	78	Fellow teachers are available to model how to use software applications and/or hardware at my school.	.388**	1
	78	Technology integration is visible in my school.	.345**	1
	78	When I receive technology related support, the people giving support are patient and do not make me feel inferior for not knowing how to do something.	.344**	2
	78	Other teachers on my grade level support me with technology integration needs and ideas.	.341**	2
	78	Teachers in my school help each other with technology integration needs and ideas.	.393**	2
	78	I have opportunities to observe other teachers integrating technology in their classrooms.	.315**	1
	78	I have the time I need to learn new technology skills.	.291**	1
	78	I have the time I need to plan technology integrated lessons.	.285*	1
	78	Over half of our school faculty integrates technology on a regular basis.	.284*	1
	78	I know the names of the technology support people who serve my school.	.275*	2
	78	I have access to many technology resources within my classroom.	.274*	1
	78	In addition to county staff development opportunities, my school offers technology related staff development.	.243*	1
	78	I wish I had someone to come to my classroom to demonstrate technology rich lessons.	-.327**	2
	77	I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively	-.371**	2
	78	I feel frustrated by the complexity of technology when I participate in technology staff development.	-.317**	1

** .01 level, *.05 level (2-tailed)

Table 51 shows the six positive correlations to the statement *When I receive technology related support, the people giving the support are patient and do not make me feel inferior for not knowing how to do something*, with which 95% of respondents agreed or strongly agreed. A positive correlation is apparent between patient support personnel and a change in teaching philosophy because of staff development. Access to resources, access to people who can answer technology related questions, and quick repairs of nonworking technology are also positively correlated to patient support personnel.

Table 51

Correlations with Patient Support Personnel

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
When I receive technology related support, the people giving support are patient and do not make me feel inferior for not knowing how to do something.	77	I know the names of the technology support people who serve my school.	.602**	2
	78	When I e-mail a technology support person, I get a response quickly.	.602**	2
	78	When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	.362**	1
	78	My teaching philosophy has changed because of technology related staff development.	.250*	3
	78	When I have a technology related question, I can quickly find someone in my school to help me with the question.	.344**	2
	78	I have access to many technology resources within my classroom.	.235*	1

** .01 level, *.05 level (2-tailed)

Table 52 shows the 12 items correlated with the statement *When I e-mail a technology support person, I get a response quickly*, with which 94.9% or respondents agreed or strongly agreed. This indicates the majority of participants feel their emails are quickly answered. An item on frustration with technology and desire for more support was the only item negatively correlated to this statement. In the area of impact on

classroom instruction, a positive correlation is observed between staff development being effective in motivating teachers to integrate technology and quick email responses from technology personnel. Visibility, relative advantage, and compatability were all present in correlations to this statement. Other items related to support also appeared in correlations.

Table 52

Correlations with Quick Response from Support Personnel

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
When I e-mail a technology support person, I get a response quickly.	77	When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	.635**	1
	77	I know the names of the technology support people who serve my school.	.630**	2
	77	When I receive technology related support, the people giving support are patient and do not make me feel inferior for not knowing how to do something.	.602**	2
	76	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.436**	2
	77	When I have a technology related question, I can quickly find someone in my school to help me with the question.	.425**	2
	77	Teachers in my school help each other with technology integration needs and ideas.	425**	2
	77	Technology integration is visible in my school.	.329**	1
	77	In addition to county staff development opportunities, my school offers technology related staff development.	.290*	1
	77	Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	.245*	1
	76	Student work involving technology integration is often printed and hung in the hallways of my school.	.235*	1
	77	District technology integration training I have participated in has been effective in motivating me to integrate technology.	.226*	3
	76	I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively	-.262*	2

** .01 level, *.05 level (2-tailed)

Table 53 shows the 22 items correlated with the statement *Other teachers on my grade level support me with technology integration needs and ideas,* with which 74.7% of respondents agreed or strongly agreed. Seventeen correlations were apparent in the area of elements of diffusion. The only negative correlation was a sense of frustration with technology staff development because of feeling the course was on already known information. Three support related items positively correlated with the feeling that fellow teachers on one's grade level provided support. Two positive correlations were observed in the area of impact on classroom instruction. Frequently using technology ideas learned in staff development classes and being motivated to integrate technology because of technology related classes both positively correlated with the feeling that other grade level teachers are supportive with integration needs and ideas.

Table 53

Correlations with Grade Level Colleague Support

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
Other teachers on my grade level support me with technology integration needs and ideas.	78	Technology integration is visible in my school.	.527**	1
	78	Teachers in my school help each other with technology integration needs and ideas.	.522**	2
	78	Technology integration is often part of local school staff development.	.453**	1
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.452**	1
	78	When I have a technology related question, I can find someone in my school to help me with the question.	.451**	2
	78	Fellow teachers are available to model how to use software applications and/or hardware at my school.	.433**	1
	78	I have access to many technology resources which can be checked out from our school media center.	.419**	1
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.375**	2
	78	When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	.341**	1
	78	Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	.331**	1
	78	Over half of our school faculty integrates technology on a regular basis.	.330**	1
	77	Student work involving technology integration is often printed and hung in the hallways of my school.	.323**	1
	78	I feel technology related staff development motivates me to integrate technology in my classroom.	.292**	3
	78	I have the time I need to plan technology integrated lessons.	.287*	1
	78	I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school	.266*	1
	78	I have resources in my school (web page, software help, etc.) which cut down on the time I need to plan technology integrated lessons.	.259*	1
	76	I have opportunities to try new technology in my school.	.256*	1
	78	The leaders (administrators, etc) demonstrate use of technology when presenting to the faculty at my school.	.256*	1
	78	I have access to many technology resources within my classroom.	.251*	1
	78	I have observed a fellow teacher teaching a technology integrated lesson	.237*	1
	78	I frequently use technology ideas which I learned in a technology staff development class	.229*	3
	76	I feel frustrated in technology related staff development because I feel I am taking a class on information I already know	-.229*	1

** .01 level, *.05 level (2-tailed)

Table 54 shows the 27 items correlated with the statement *Teachers in my school help each other with technology integration needs and ideas*, with which 87.3% or respondents agreed or strongly agreed. The high level of agreement with this statement and the positive correlations with indicators of implementation suggest the importance of peer support. One positive correlation, staff development motivating teachers to use technology, falls in the area of impact on classroom instruction. Six items are positively correlated in the area of support. A negative correlation between a desire to have someone come to one's classroom and model lessons and the feeling that teachers within the school help each other with technology needs and ideas shows consistency in response, and a negative correlation with issues of complexity indicates that the more teachers collaborate the less complex technology integration becomes. The remaining items are positively correlated with elements of diffusion.

Table 54

Correlations with Teachers within School Helping Each Other

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
Teachers in my school help each other with technology integration needs and ideas.	78	Technology integration is visible in my school.	.713**	1
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.679**	2
	78	I have access to many technology resources which can be checked out from our school media center.	.545**	1
	78	Fellow teachers are available to model how to use software applications and/or hardware at my school.	.541**	1
	78	Other teachers on my grade level support me with technology integration needs and ideas.	.522**	2
	78	Technology integration is often part of local school staff development.	.514**	1
	78	Over half of our school faculty integrates technology on a regular basis.	.497*	1
	78	Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.	.453**	1
	78	I have opportunities to observe other teachers integrating technology in their classrooms.	.434**	1
	78	Technology staff development I receive helps simplify technology integration for me.	.430**	1
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.425**	1
	77	When I e-mail a technology support person, I get a response quickly.	.425**	2
	77	Student work involving technology integration is often printed and hung in the hallways of my school.	.420**	1
	78	When I have a technology related question, I can find someone in my school to help me with the question.	.415**	2
	78	When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).	.393**	1
	76	I have opportunities to try new technology in my school.	.366**	1
	78	I have access to many technology resources within my classroom.	.321**	1
	78	I have the time I need to learn new technology skills.	.313**	1
	78	I have the time I need to plan technology integrated lessons.	.295**	1
	78	I have resources in my school (web page, software help, etc.) which cut down on the time I need to plan technology integrated lessons.	.293**	1
	78	I feel technology related staff development motivates me to integrate technology in my classroom	.283*	3
	78	I know the names of the technology support people who serve my school.	.249*	2
	78	I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school	.236*	1
	78	The leaders (administrators, etc) demonstrate use of technology when presenting to the faculty at my school.	.235*	1
	78	Technology staff development I participate in matches my teaching philosophy.	.226*	1
	78	I wish I had someone to come to my classroom to demonstrate technology rich lessons.	-.241*	2
	78	I feel frustrated by the complexity of technology when I participate in technology staff development.	-.298**	1

** .01 level, *.05 level (2-tailed)

Support Qualitative Analysis

Qualitative coding began with a general theme of support. All items coded as related to the area of support were then analyzed and clustered into subcategories under the umbrella of support. The following subcategories were formed to better illustrate the role of support: (a) support staff is knowledgeable and provides resources and extra assistance, (b) support staff is encouraging and helpful, (c) support staff quickly responds to teacher needs, (d) support staff communicates with teachers, (d) support staff works to resolve issues, and (e) peer support is valuable. In addition, four more subcategories were formed to illustrate teacher concerns: (a) desire to have more access to support, (b) frustration with timeliness of repairs, (c) frustration with first responders (most likely mentors), and (d) frustration with network security. Although codes were needed for teacher concerns in the area of support, these concerns were not widespread.

Support staff is knowledgeable and provides resources and extra assistance. The provision of resources such as tip sheets on how to use particular technology, email responses to individual teacher questions, and extra time to review or extend skills one on one or in small groups was evident in the qualitative data. Teachers felt like this assistance supported them and made them more comfortable trying new technology. The following quotations from the online survey illustrate teachers' feelings about support personnel being knowledgeable and helpful.

> All of the instructors are not only knowledgeable but also extremely helpful. I would recommend this program to every teacher.

> Our school technology (specialist) has done a great job. She has given us the equipment and little training sessions. Then she follows up with us to ensure we are comfortable!

Interviewees also felt support personnel gave extra resources and assistance when ever needed. They felt the level of support was beyond support available in previous staff development experiences.

> [name] here at the school is very supportive. The technologists, one is a trainer and one fixes the problems, they are both wonderful. If I ever email the trainer a question she will say, "I'll be there tomorrow. Can I come during your planning time? and I will walk you through this." We have all this kind of support and emails from the county office with support and encouragement. A lot more support and feedback than you would get from your average staff development. (Interview 4)

> All of the support in all of these classes. It's 75-100 hours in class with someone where they are training you on different things you can use the technology with. I don't think we have ever had anything like that before where there was that much training and that much support. (Interview 8)

> I've done technology courses before, but they told you what you were going to take and that was it. Everyone did the same thing and then I don't think there was that support to follow up afterwards where you know they will come in and help if you need them. You can email them and ask a question and then there are other courses. They'll come in and refresh. They'll send notes. So I think just that backup support. In most other trainings you're just done and you're finished. (Interview 8 in response to how this is better or worse than other staff development)

The following web log entry triangulates with the other quotations on knowledgeable support personnel who provide additional resources and support.

> I was finally able to upload my last podcast with the help of [name] our tech specialist here @ [school name]. I think I understand now how to do it! It sometimes takes a while for this old brain to grasp new concepts especially when it involves a lot of technical steps. (Web log 2)

Support staff is encouraging, helpful. Data indicated support staff to be encouraging, helpful, patient and timely. A feeling of trust of support staff was also present, with teachers feeling they could ask questions without be made to feel stupid for not already knowing the answers. Teachers felt the support staff wanted the program to

be successful for teachers and students. Some of the quotations indicated a sense of everyone; teachers, technology staff, and leadership in the county as a whole, working to make the program effective. The following quotations are from the online survey open ended responses.

> I am very encouraged with the support and encouragement I am receiving.
>
> The support has been great. Getting in on the ground level has been nice--I think that everyone involved wants this program to be a success.
>
> I have had only positive experiences with support during the initiative.

Interviewees also felt encouraged by support personnel and were not afraid to ask questions. Interviewees felt the support personnel were helpful and often followed up with questions to ensure they were comfortable with their new technology skills. Interviewees also were not made to feel that any questions were unreasonable or too simple.

> They're very supportive during the class time, always available to answer questions never condescending. If you ask a question that you feel may be a stupid question, they don't make you feel it is a stupid question. Then after, in between classes, they are always sending extra information with tips to use and what they are planning for next week. Always keeping the contact going back and forth. (Interview 2)
>
> I don't feel frustrated and I know if I have any questions after I start using the technology all I have to do is email someone in the county and they will come help me. It is a lot better you kind of have a home base to go to. (Interview 4)
>
> [Tech support name] has come by many times. She'll just poke her head in the door and say you doing good? You need any help with anything? She'll email all the time and say is everything good. Do you need anything? She is always right there. (Interview 13)

Support staff quickly responds to teacher needs. Support staff is timely in its response to teacher needs. Teachers feel they have quick access to support staff whether

it is something that can be fixed or assisted with remotely or with a visit to the classroom. The following quotations from the online open ended responses illustrate timely response to teacher needs.

> Whenever problems with the software or hardware occur, the technology staff is quick to respond. I feel very supported in using new technology and have been fortunate to receive new computers and the latest in presentation materials.

> I have never lacked for any help. It has always been efficient and prompt. Support so far has been amazing. Our tech specialists are an amazing group of people who are available just about any time. We either use the data base or I'll sneak in an e-mail for a bit of advice. They can usually point me in the right direction.

Interviewees also expressed that support personnel were available whenever they were needed. The quickness of email responses and availability of support personnel to work with teachers one on one with specific issues was mentioned.

> A lot of times it is through meetings we have or courses you sign up for, but they are available whenever… if I go home and I'm like man I forgot what she said about this part, I can e-mail them quickly and they will reply. (Interview 1)

> A great deal of hands on support. … Even when you feel frustrated there is a tech support person that you can email and I would say in less than 24 hours I can have someone here to assist me and show me what to do. (Interview 7)

The following web log entry triangulates with the other data sources indicating that support personnel respond to teachers' needs.

> Now that our computer, whiteboard, and projector are all in "agreement with each other" we have met with success the use of our technology. Many thanks to [names of two tech support personnel] who spent well over one hour helping to get everything taken care of. I am excited that the "stress and fear" of something not working correctly is slowly evaporating! (Web log 7)

Support staff communicates with teachers. Communication between teachers and support staff is evident in the data. Teachers feel they have access to people who can answer their questions, and that these people are strong in communicating to them ways

to improve their technology integration skills. Teachers also feel they have access to multiple technology support staff, instructors, mentors, technology support personnel who serve their school, and even the program director, who communicate with them answering any questions they may have. The following quotations from the online survey illustrate teachers' feelings about communication with support personnel.

> The instructors that I have had in class are friendly and helpful. They send reminder e-mails and have step by step instructions to go back to if you get stuck. I can e-mail any of them with a question and will have a quick response.
>
> Awesome. All of my course teachers have been excellent. Any time I have had a problem or question it has been answered very timely. I don't feel that I am in this alone.
>
> Whenever I have had a question, I can email either [two names] and get a response back quickly. [name] is very good about scheduling time to meet with me to go over any problems I am experiencing.

Interviewees indicated support personnel communicated with them on a regular basis. It was helpful to them to know how to communicate their needs with school and district personnel.

> Really just knowing who to go to because if you don't know who to go to your not going to ask – you know you're more kind of timid to ask – you know the technology specialist and support team want this to work and they are just as interested in it as the participants. It is really easy to go to them. (Interview 1)
>
> We have correspondence with the instructors via email throughout the week if we need assistance or to provide anything they think might help. (Interview 2)

Support staff works to resolve issues. Teachers felt that issues were addressed and any concerns were not ignored. Also, teachers understood that the technology staff was learning about all of the new equipment also and appreciated when they would search for answers for which even they may not have known the solution. The following quotations

from the online survey illustrate how teachers feel support personnel work to resolve issues.

> Our technology staff has always been very professional and worked very hard to get my equipment up and running. I had to wait much longer than others to get my promethean stuff because I am in a mobile, but once it was installed [name] and [name] have been fabulous in fixing problems and training.

> We have an excellent tech support system at our school. They are always available and help frequently. If they do not have an answer, they will find out and get back to me. Much of this technology is new to them as well, so we are learning together.

Interviewees also indicated support personnel worked to resolve issues. One interviewee indicated the support staff made it mandatory to have the equipment installed before taking a class in order to resolve issues with teachers forgetting important information between the class and installation of equipment. In addition, one interviewee expressed how she felt support personnel dealt with issues directly and did not ignore issues brought to their attention by teachers.

> I took Promethean 101 and 102 in the summer and I didn't have the board until October and you either use or loose. But now they have corrected that and you can't even sign up for the class without the whiteboard in hand so that was a great fix. (Interview 5)

> They are basically going from scratch and I think people have been pretty opened minded. I'm sure you have a couple of glitches. I'm sure along the way. But none that I've heard too much about, and if there were issues, there must have been, and it must have been handled very quickly and it was handled. You know it wasn't shoved under the rug or said it is ok you can live with that or you know they handled everything as it came. I really think they handled things because if they didn't I would have heard more. I know some of the girls in the school had some issues with the Promethean board having some issues, some technical issues, but they got people right in for them. (Interview 6)

The following web log entry expresses how one teacher was thankful for technology support personnel enlarging her space for saving on the network when she had an issue with saving work because the files were too large.

> My Movie Maker Class was a bit frustrating this week. I couldn't download anything because I ran out of space in my documents. I am crossing my fingers that my space can be enlarged, or Technology can help me in some way. [next week entry] Technology must have helped me out because I haven't had any other problems downloading things. Thank you! (Web log 6)

Peer support is helpful. Teachers indicated increased peer support, collaboration, and creativity among their fellow teachers. Even though collaboration was not an overall focus for the program, it appears the program led to increased collaboration among teachers. Having peers with whom to go through this staff development process helps teachers. The following quotations are from open ended responses on the online survey.

> It spurs creativity. We collaborate as a grade level on flip charts and other technology related components.

> I have noted an increased collaboration with other [program name] teachers.

> It has been great for our school because we have had so many teachers participate in the program. At [school] we have 8 teachers in just my grade level in the program. We have been able to share ideas, websites and flipcharts with each other which has made it easier for us to plan out lessons.

Interviewees also indicated increased collaboration among peers. It appears that having a number of teachers participating in the staff development initiative together helped teachers. They liked being able to share ideas and benefited from the extra support that they were able to provide each other.

> The fact that there are 10 of us going through it together. We can bounce ideas off each other and if we do get frustrated we can get together and usually someone has some idea that will help you and get you through whatever is frustrating you at that time. I think the fact that you have more people going through it than just yourself. You have all that added support of your peers. (Interview 4)

> Probably being able to talk to other people who are doing it. We have the web logs so that is nice to be able to go on and see what other people are feeling…. We have a very supportive group of teachers here and not only that but they like to be able to get together and brainstorm. When we were writing our capstones we had several capstone meetings and we were all sitting together helping each other out. That is nice because we didn't have that competitiveness. It was more of that was a great idea and you know what else you could do or people found out that someone was doing podcasting and they found some information on it and copied it for that person I like the collaboration among my peers and not just kindergarten. I have talked to some fifth grade teachers about what projects they are doing and they have helped me with mine. (Interview 6)

Web log entries also triangulate with the other entries about peer support. Teachers indicated in their web logs thankfulness for peer support. They felt the peer support made the process easier.

> It had been suggested that we establish a tech buddy with which to ride out any rough spots in this two-year long storm. While I haven't formally done so, it is with pleasure that I am able to help out folks with whom I don't normally have contact. I'm sure that one day in the not too distant future I will be asking them for help. (Web log 5)

> A big thank you to our building mentor, [name], for collecting catalogs and ideas to use in deciding upon our capstone project. She has also proposed that the [school name] folks set aside a common planning time and work together to get our capstone ideas down on paper. I appreciate her willingness to collaborate and to serve as a central point to field questions we might have as we work through this process. (Web log 5)

> I am finally getting myself up to date on my webpage. It is so much easier when you sit down and work with a partner or two. I have met with the other [Name of Program] teachers at my school so that we can all see how to record what we are working on. (Web log 14)

Some concerns related to support were expressed in the open ended responses on the online survey. It should be noted that only a small percentage of 281 responses expressed concerns and many of the concerns were more suggestions on how to make things better.

Desire to have more access to support. Four teachers indicated a desire for more support. They appeared to be understanding of the current level of support, but wish they had more personalized and easier access to support.

> Our instructional tech specialist has been awesome! …My only complaint is that she is not full time in our school. Obviously, there are times when I need someone to help solve a problem and she is not there. Our tech specialist is on site everyday and he has been very good with solving equipment problems.

> I think it is pretty good but I wish it could be a little more personalized.

> There has been a lot of email support, but not so much support face to face. I have received all the equipment promised to implement each part of the initiative. I have learned a lot, but outside of the training class I realize there are missing links in my knowledge of technology that impede my full working knowledge or usage of what I have learned.

> I think since the inception of the program, I am learning I can ask for support. I don't always get the help I need when I need it but that is because support is extremely busy with all they have to do. I don't blame them. I think we need more support personnel.

Frustration with timeliness of repairs. One respondent to the online survey expressed concern that repairs were not made as quickly as he/she would like.

> Somewhat frustrating at times, as is using technology anyway. It doesn't work when you want it too. It takes too long to get things fixed, and the teachers are not in the loop as to the timeline.

Frustration with first responders [most likely school based mentors]. One respondent to the online survey expressed concern about the knowledge level of the school based mentors. Mentors are classroom teachers who serve as a mentor to others in the program.

> I am able to find answers and gain support. Often, I skip levels of workers to find answers. I have found that the first responders are often uninformed and lack knowledge to help.

Frustration with network security. One respondent felt frustrated with network security issues.

> Very good support from lower levels of [name] Technology folks on network security side not helpful or onboard program

Summary Question Two

Both qualitative and quantitative data indicate teachers felt supported throughout their staff development experience. Assistance was received from both support personnel and fellow teachers. Qualitative and quantitative data indicated personnel were encouraging, helpful, and timely in resolving issues and answering questions. Evidence of a high level of communication between support staff and teachers was also evident in quantitative and qualitative data. Correlations indicated a positive tie between support and teachers being motivated to frequently integrate technology.

Qualitative data analysis indicated support within this staff development initiative was more prevalent than in other staff developments in which teachers had participated. Teachers felt assistance was available whenever needed and that support personnel followed up with them frequently to make sure they were successful. Peer support was also a common element prevalent in qualitative data. Teachers felt that peer support helped them in the learning process and with ideas to integrate technology.

Both quantitative and qualitative data demonstrated widespread support within the staff development initiative from both technology personnel and peers. Support from technology personnel and peers contributed to the effectiveness of the staff development initiative.

Question Three:

How do Teachers Experience Technology Staff Development

and the Impact of Staff Development on their Classroom Technology Integration?

Question three deals with the impact of the staff development initiative in terms of how teachers experienced the staff development and the impact of the staff development on their classroom teaching. Six questions were added to the online survey to examine this question from a quantitative perspective. In addition, other items from the survey revealed teachers' experiences and the impact of their experience on their classroom teaching as seen by the correlations in the following tables. Qualitative data were also collected via open ended questions on the online survey, teacher interviews, and teacher web logs in regards to this research question.

Classroom Impact Quantitative Analysis

Over 95% of teachers responding to the online survey reported they either agreed or strongly agreed they frequently use ideas learned in class, felt motivated by this staff development initiative, and learned the skills they needed to integrate technology more effectively. Almost 70% of teachers reported they agreed or strongly agreed this staff development initiative changed their teaching philosophy. Only 11.5% of teachers agreed or strongly agreed that they were excited about technology staff development but were not able to take the ideas they learned in staff development back to their classrooms. The majority of teachers, 76.9%, disagreed or strongly disagreed with the statement that they were not able to apply what they learned in their classroom. Table 55 shows these results.

Table 55

Teacher Staff Development Experience and Classroom Impact Survey Item Frequencies

	N	*Strongly Disagree*	*Disagree*	*Undecided*	*Agree*	*Strongly Agree*
I frequently use technology ideas which I learned in a technology staff development class.	79	2.5% (2)	0 (0)	0 (0)	45.6% (36)	51.9% (41)
I feel technology related staff development motivates me to integrate technology in my classroom.	79	0 (0)	0 (0)	2.5% (2)	36.7% (29)	60.8% (48)
I often am excited about technology when I take technology related staff development, but am not able to take what I learn in the staff development and apply it to my classroom.	78	20.5% (16)	56.4% (44)	11.5% (9)	5.1% (4)	6.4% (5)
District technology integration training I have participated in has been effective in motivating me to integrate technology.	79	0 (0)	1.3% (1)	0 (0)	34.2% (27)	64.6% (51)
District technology integration training I have participated in has been effective in teaching me skills needed to integrate technology.	79	0 (0)	1.3% (1)	2.5% (2)	39.2% (31)	57.0% (45)
My teaching philosophy has changed because of technology related staff development.	78	1.3% (1)	12.7% (10)	16.5% (13)	45.6% (36)	24.1% (19)

Table 56 shows the eight items correlated with the survey statement *I frequently use technology ideas which I learned in a technology staff development class*, with which 97.5% of respondents agreed or strongly agreed. Two positively correlated items deal with the level of support received throughout the staff development initiative. The highest correlation deals with ongoing support with 87.2% of teachers agreeing or strongly agreeing that they felt supported even after staff development experiences ended. Data also revealed a negative correlation between this statement and the statement indicating frustration and desire for more support. These correlations appear to link support with frequently using technology ideas learned in staff development. Observability, compatibility and relative advantage are also positively correlated with frequently using technology ideas learned in staff development.

Table 56

Correlations with Using Ideas Learned In Staff Development

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I frequently use technology ideas which I learned in a technology staff development class.	77	I feel supported with technology integration even after a technology staff development opportunity has ended.	.413**	2
	78	The leaders (administrators, etc) demonstrate use of technology when presenting to the faculty at my school.	.407**	1
	78	I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school	.392**	1
	78	I feel technology related staff development motivates me to integrate technology in my classroom	.311**	3
	78	I have access to many technology resources which can be checked out from our school media center.	.301**	1
	78	Technology integration is often part of local school staff development.	.284*	1
	78	Technology integration is visible in my school.	.240*	1
	77	I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively	-.275*	2

** .01 level, *.05 level (2-tailed)

Table 57 shows the 15 items correlated with the statement *I feel technology related staff development motivates me to integrate technology in my classroom*, with which almost everyone (97.5%) agreed or strongly agreed. Two of the fifteen correlations are negative. Nine of the correlations deal with elements of diffusion with enjoyment of technology staff development the item most highly correlated. Strong correlations were also shown among four of the five other items addressing the impact of technology staff development within teachers' classrooms. The second and third highest correlations deal with staff development opportunities providing both effective skill training and motivation. The two support related items which show positive correlations to this statement deal with peer support from fellow teachers. Negative correlations deal with repetitiveness of staff development and lack of opportunities to learn something new.

Table 57

Correlations with Motivation because of Staff Development

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I feel technology related staff development motivates me to integrate technology in my classroom	77	I enjoy technology related staff development	.671**	1
	78	District technology integration training I have participated in has been effective in teaching me skills needed to integrate technology.	.628**	3
	78	District technology integration training I have participated in has been effective in motivating me to integrate technology.	.603**	3
	78	Technology staff development I receive helps simplify technology integration for me.	.456**	1
	78	Technology staff development I participate in matches my teaching philosophy.	.386**	1
	78	I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school	.356**	1
	78	Technology integration is visible in my school.	.345**	1
	78	I frequently use technology ideas which I learned in a technology staff development class	.311**	3
	78	Other teachers on my grade level support me with technology integration needs and ideas.	.292**	2
	78	Teachers in my school help each other with technology integration needs and ideas.	.283*	2
	76	I have opportunities to try new technology in my school.	.276*	1
	78	My teaching philosophy has changed because of technology related staff development.	.256*	3
	78	I have the time I need to learn new technology skills.	.245*	1
	76	I feel frustrated in technology related staff development because I feel I am taking a class on information I already know.	-.263*	1
	78	I feel technology related staff development is repetitive and does not offer opportunities to learn new programs.	-.318**	1

** .01 level, *.05 level (2-tailed)

Table 58 shows the four items correlated with the statement *I often am excited about technology when I take technology related staff development, but am not able to take what I learn in staff development and apply it to my classroom*, with which 76.9% or respondents disagreed or strongly disagreed. This disagreement indicates that over three-

fourths of participants feel they are able to apply what they learned in technology staff development classes within their own classroom. All correlations with this statement were negative with three of the four correlations dealing with elements of diffusion. One correlation deals with support. All of the correlations to this statement deal with access issues.

Table 58

Correlations with Not Being Able to Implement what is Learned in Staff Development

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
I often am excited about technology when I take technology related staff development, but am not able to take what I learn in the staff development and apply it to my classroom.	76	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	-228*	2
	77	I have access to many technology resources which can be checked out from our school media center.	-.246*	1
	77	I have resources in my school (web page, software help, etc.) which cut down on the time I need to plan technology integrated lessons.	-.312**	1
	77	I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school	-.330**	1

** .01 level, *.05 level (2-tailed)

Table 59 shows the 15 items correlated with the statement *district technology integration training I have participated in has been effective in motivating me to integrate technology*, with which 98.8% of respondents agreed or strongly agreed. Three of the positively correlated items deal with support. Impact on classroom teaching is apparent in correlations with this statement. The effectiveness of the staff development in teaching new skills shows the highest correlation with this item. Positive correlations are also seen with motivation and change in teaching philosophy. The other nine correlations deal with elements of diffusion. Not having opportunities to learn new programs is negatively correlated.

Table 59

Correlations with District Training Motivating

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
District technology integration training I have participated in has been effective in motivating me to integrate technology.	78	District technology integration I have participated in has been effective in teaching me skills needed to integrate technology.	.848**	3
	78	I feel technology related staff development motivates me to integrate technology in my classroom	.603**	3
	77	I enjoy tech related staff development	.503**	1
	78	Technology staff development I participate in matches my teaching philosophy.	.385**	1
	78	Technology staff development I receive helps simplify technology integration for me.	.360**	1
	78	I know the names of the technology support people who serve my school.	.326**	2
	76	I have opportunities to try new technology in my school.	.315**	1
	78	Technology integration is visible in my school.	.275*	1
	78	I have access to many technology resources within my classroom.	.272*	1
	78	My teaching philosophy has changed because of technology related staff development.	.264*	3
	78	I have the time I need to learn new technology skills.	.261*	1
	78	I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school	.245*	1
	77	When I e-mail a technology support person, I get a response quickly.	.226*	2
	78	I feel technology related staff development is repetitive and does not offer opportunities to learn new programs	-.257*	1
	77	I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively	-.266*	2

** .01 level, *.05 level (2-tailed)

Table 60 shows the 19 items correlated with the statement *district technology integration training I have participated in has been effective in teaching me the skills needed to integrate technology*, with which 96.2% or respondents agreed or strongly agreed. Three of the correlations are negative with the remaining sixteen showing a

positive correlation. Three of the correlations, including the two highest correlations, deal with the impact of staff development on classroom instruction. There appears to be a high correlation between staff development being motivating, the two highest correlations, and its effectiveness on teaching necessary skills. Five of the correlated items deal with support with two of the three negative correlations falling in this category. A connection between the effectiveness of the staff development in teaching skills and the feeling of needing additional support seems to be apparent in the form of negative correlations. Eleven of the correlations deal with elements of diffusion.

Table 60

Correlations with District Training Effective in Teaching Skills

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
District technology integration training I have participated in has been effective in teaching me skills needed to integrate technology.	78	District technology integration training I have participated in has been effective in motivating me to integrate technology.	.848**	3
	78	I feel technology related staff development motivates me to integrate technology in my classroom	.628**	3
	78	I have access to many technology resources within my classroom.	.408**	1
	77	I enjoy tech related staff development	.400**	1
	78	I have the time I need to learn new technology skills.	.292**	1
	78	Technology staff development I participate in matches my teaching philosophy.	.383**	1
	78	Technology staff development I receive helps simplify technology integration for me.	.362**	1
	78	I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school	.291**	1
	77	I have the opportunity to go to demonstrations of new technology where I can try it out for myself.	.267*	1
	78	Technology integration is visible in my school.	.262*	1
	78	I know the names of the technology support people who serve my school.	.259*	2
	78	Technology integration is often part of local school staff development	.251*	1
	78	Other teachers on my grade level support me with technology integration needs and ideas.	.247*	2
	76	I have opportunities to try new technology in my school.	.237*	1
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.236*	2
	78	My teaching philosophy has changed because of technology related staff development.	.229*	3
	77	I feel that technology related staff development often moves too fast for me to learn the skills which I need.	-.233*	1
	78	I wish I had someone to come to my classroom to demonstrate technology rich lessons.	-.248*	2
	77	I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively	-.297**	2

** .01 level, *.05 level (2-tailed)

Table 61 shows the nine items correlated with the statement *my teaching philosophy has changed because of technology related staff development*, with which 69.7% or respondents agreed or strongly agreed. All of these correlations are positive with items being equally divided among elements of diffusion, support, and impact on classroom teaching. In the area of elements of diffusion relative advantage and

compatibility appeared in correlations. Correlations indicate motivating staff development opportunities and effective teaching of technology skills impact teaching philosophy.

Table 61

Correlations with Change in Teaching Philosophy

Item	*N*	*Correlated Item*	*Correlation*	*Question #*
My teaching philosophy has changed because of technology related staff development.	78	I always have the software programs or hardware which is taught in staff development courses readily available for my use in my school	.327**	1
	78	Technology staff development I participate in matches my teaching philosophy.	.283*	1
	77	I feel like I have access to technology integration support whenever I need it so I can effectively integrate technology in my classroom.	.272*	2
	78	District technology integration training I have participated in has been effective in motivating me to integrate technology.	.264*	3
	78	I feel technology related staff development motivates me to integrate technology in my classroom	.256*	3
	78	When I receive technology related support, the people giving support are patient and do not make me feel inferior for not knowing how to do something.	.250*	2
	78	I have the time I need to learn new technology skills.	.247*	1
	78	District technology integration I have participated in has been effective in teaching me skills needed to integrate technology.	.229*	3
	78	I know the names of the technology support people who serve my school.	.224*	2

** .01 level, *.05 level (2-tailed)

Classroom Impact Qualitative Analysis

Qualitative data utilized for answering question three were initially coded for change in teacher thinking or teaching. Coded data were then clustered into subcategories to better understand how this program changes teacher thinking or teaching. The subcategories are: (a) technology integration is more frequent, (b) teachers feel rejuvenated and or empowered to learn, (c) teachers feel their teaching is changed or better, and (d) students are more engaged.

Technology integration is more frequent. Many teachers indicated that they now integrate technology on a daily basis or at least more frequently than they integrated technology before the program. The following open ended responses to the online survey express frequent technology integration.

> I use technology on a daily basis. Students love it. The new ceiling speakers, enable every student to hear presentations clearly and evenly. With fast and reliable computers, students are anxious to use them daily.
>
> It has made it a part of my daily teaching. With no cords or set up problems, or checking out - I am more likely to use it.
>
> I use technology on a daily basis with the students. Before, I mostly used technology, but did not integrate it as much with the students.

Interview responses also indicated an increase in frequency of technology integration. Some interviewees felt they integrated technology a lot prior to this staff development experience, but still saw increases with their technology integration.

> Tremendously impacted my use of technology. We used the computers a lot, but now we use the laptops on a daily basis because almost everything we are doing now is on the computer every day. (Interview 2)
>
> I'm just getting used to using it this year and now I can't imagine not having it. I'm so use to it that it's part of my life and if it goes down I'm in trouble. The staff development that we are getting is so much more useful on how to use it in the classroom. … I use it all the time for everything, every subject all day long. (Interview 4)

Qualitative data collected in web logs also indicates an increase in frequency of technology integration. Triangulation was found among all sources of qualitative data in response to increase in technology integration.

> I have found myself using technology in my classroom on a daily basis in almost every subject. I find it very easy to integrate technology into my Science and Math activities, and I am striving to find better ways to use technology in language arts. (Web log 12)

> Flipcharts have now become just a regular part of our day. The students love it and they beg to be called on to come up to the board. I know they are much more engaged as a result of having this equipment in my room! (Web log 16)

Teachers feel rejuvenated and/or empowered to learn. Teachers indicated a renewed energy and desire to learn more skills to integrate more technology. Teachers were active learners. They reflected on their own learning experiences and the sense of accomplishment they achieved when mastering new technology. Teachers were excited about new possibilities for classroom instruction. The following quotations from open ended responses on the online survey illustrate a feeling of rejuvenation or empowerment to learn.

> I have been rejuvenated. I have always loved technology, but have always felt the need to control it in my classroom. [program name] has allowed me to feel comfortable giving up that control over to my students more.

> I have been given the tools and the knowledge to do things with my classes that I never would have dreamed possible. The parents are very thankful for the technology, as well. During my open house, I demonstrated the new technology to them. They responded by giving me a standing ovation and asked to see more!

Interviewees also indicated they were rejuvenated in their teaching and learning experiences. Interviewees expressed that the challenges of learning something new gave them a feeling of accomplishment. The challenges within the program and their experiences as learners helped them see more possibilities for their students.

> Makes me more confident. During the process sometimes the anxiety level is very high, when you don't understand it. But when you work through it and figure it out, you get the nice feeling of oh wow I accomplished something that was really challenging. (Interview 2)

> Being a new teacher here to [name] county I have found that my learning curve is totally up all the way through. I am 57 years old…. I feel like my batteries have been charged up more so than ever in the county that I came from. (Interview 7)

Teacher web logs provided some of the best illustrations of how teachers faced the challenges of learning to use new technology resources. A glimpse of the sense of accomplishment these teachers felt when learning new technology and a sense of rejuvenation within their own learning experiences can be seen through these quotations. Some of these quotations are long because they show teacher growth over a period of time over several weeks of web log entries. They also illustrate the struggle teachers had with learning new technology and the success of this staff development experience that they continued on with the learning process instead of deciding the technology was too difficult to learn.

> I started Podcasting this week-what fun! We created our first Podcast. We'll be finishing and adding it iTunes next week! I can't believe that I'll be able to go to iTunes and play my own Podcast! (Web log 2)

> The highlight for the week was having a child tell me that I looked like I'd been using one of those forever [referring to the Promethean Panel]. It is nice to have my hard work pay off & even be recognized by my students, which is who I am doing it for…. This week's technology accomplishment was getting my webpage finished and posted on the Internet. I really love the way it turned out & believe that it will be a valuable resource to my parents and students. I added components that would make my students want to visit the webpage frequently, hoping that this would encourage their parents to look at it as well. I have already received some very positive feedback from the parents that have looked at it - the hit counter was at 50 this morning when I came in!! This was the first night that it was posted on the Internet - I think that is a pretty good opening day! :) (Web log 8)

> I was so excited to begin using it that I even got permission from our principal for the [program name] teachers at [school name] to come in and investigate the whiteboard during our Winter break. (Web log 12)

> I am very excited that [program director name] contacted me to give permission for me to take an online class through iEARN. This is a very in-depth network of people around the world who collaborate to bring authentic learning tasks to students. Eventually my students will be involved in projects that connect them to students all around the world! Of course, I had to agree to teach a [program name] course on iEARN, so I am nervous about how I will develop my learning

> in the class into something I can bring to other educators in our district. (Web log 16)

Teachers feel their teaching is changed or better. Teachers expressed they felt their teaching has improved because of this staff development program. Teachers also indicated a change in their use of technology from more drill and practice software uses like SuccessMaker to more project driven uses of various multimedia applications. The following quotations from the online survey illustrate change in teaching. The following quotations are a sampling from the many quotations which indicated a change in teaching.

> I look at teaching lessons differently now. The students don't have to listen to me talk and talk and talk. They are more involved learners than learners that are listening.

> I am constantly thinking of more and better ways to utilize the technology that has been provided for me and my students. Not a day goes by that we don't use technology as part of the learning process. I find that teaching is less about the end result and more about the process, a process that technology is a critical component of.

> Teaching and learning has become student oriented. The engaged learning experience has raised student interest in learning and provided them with creative approaches to learning and teaching others.

> I am definitely trying new things and thinking more about how to use technology to make my lessons more engaging and authentic rather than just for practice, review, and publishing.

Interviewees also indicated a change in their teaching and more engaged students as a result. Changes indicate a move to more student centered classrooms.

> I used to be more teacher centered. I guess I did a lot of the up in front teacher teaching. We did do group work and we had centers and those kind of things. Now I use a lot of resources from the internet. You know I find resources there that I wouldn’t have been able to do before because I can project it up on the board like when we are studying about the animals or whatever I could project on

> the board and the students could manipulate them. To me I'm not a totally student centered classroom, but I'm more student centered than I used to be. That is how much I've changed. I use technology everyday where I used to just use it for Successmaker or AR or if we went to the lab I would let them do Kidpix or Graph Club or something like that. We still do those things, but we do this every day. (Interview 4)

> It has made me think more about [technology]. While I would have said before [program name] I integrated, used technology which I do and I could document that easily I hadn't really viewed it as the shift that I'm making personally is to have the children view technology not just as a tool for publishing or researching, but as a tool to explore their world and then to communicate their exploration to other folks. And I think that is where we fall down in the classroom. When I designed my capstone project it was with that in mind. (Interview 5)

> I have always felt pretty comfortable with technology, but when we, I think it was in the engaged learning class, when we did the LOTTI level and it was interesting to me because I have felt comfortable with technology, but when you broke it down a little into what I use for personal use and what I use in the classroom it kind of helped me look a little deeper. I feel comfortable with it, but I don't really use it a lot with my students as far as engaging them in the activities that I do. So I think that going through the class I'm engaging them more and using more whereas before I thought I was using technology but now I feel like it's pushing a little bit further. (Interview 10)

Web log entries provide further triangulation of qualitative data indicating a change of teaching. One web log entry also expressed how the students were aware of the active learning of their teachers.

> We are still constantly learning to integrate technology into almost every aspect of our learning. This has been a slight adjustment for me. While I've always loved technology, I now find myself trying to use it in more ways than in the past. Every lesson I do, I try to think of how to incorporate the Promethean board, various software titles, or online resources. I see the sparkle in the students' eyes when we utilize the technology - it makes all of the work worthwhile. (Web log 8)

> The students love the promethean board and are very interested in all that the board will do. I think they also enjoy that the teacher is learning along with them while we experiment with different items on the board. I feel this shows the kids we are all life-long learners and never too old to learn something new! (Web log 9)

Students are more engaged. Teachers reported a higher level of student engagement. Teachers felt that students were motivated to learn, were more responsible for their learning and retained more of what they learned. Online survey responses indicated more student engagement in learning.

> It is very exciting to experience the level to which you reach students. My hardcore not interested students become very animated, excited and wanting to participate.
>
> My students are thrilled to be in my class and they really look forward to the lessons each day. The interaction they experience now is contagious and I worry about them next year if their teachers do not use technology.
>
> My students have loved all the technology lessons and I am so impressed with how much knowledge they have been able to retain from using the technology daily in my classroom.
> Technology integration has provided the means to engage my students in the learning process. Problem based learning activities and research allows my students to become more responsible for their own learning.
>
> This has been an amazing experience. I have been able to gain so much more focus from my kids as they are more engaged in the learning that they are willing and able to participate in.

Interviewees indicated students were more engaged and producing more technology driven products to illustrate their learning. One teacher mentioned students were helping each other in the learning process.

> It has changed my teaching to respect the fact that students are engaged more in technology and producing a product on things they have learned more than in the past In the past I would use it more for research or to do a PowerPoint very basic so it has definitely changed I also see less paperwork because they all have a folder [on the computer] last year they didn't have a folder online that is why I had parents come in today so parents can see the work that is another thing we need access to a way to get the work from here to home so the parents can see it and even the students could work on it at home (Interview 2)
>
> I see a lot of peer tutoring and peer helping. I think that has been a real neat experience. It is amazing some of the things that they have said. We've done

> lessons year after year, but this year they are more excited. I can see it in their eyes. (Interview 3)

> When they [students] found out that I was moving to 5th they got excited because they were like well maybe we will have you and we will still get to have it [program technology] and when the decision was made and we found out that we were looping they were just over the moon. That was the thing they kept saying … we will have ms ____ with all her cool stuff and ms ---- and all her cool stuff and it will just be great. I saw motivation out of my kids was the biggest change especially in math. Because as a general rule my science class is always very hands on they're always doing an experiment. Motivation for a 4th grader for science not a difficult task, but motivation for a fourth grader for math is less than pleasant. But when I had kids jumping out of their seat to volunteer to come up here and do a long division problem, kids who had probably never gone to the board unless I specifically called them out to come up. It just amazed me. They were more willing to take that risk because I guess they thought I may get it wrong, but I get to come to this cool board and I get to do it that way. So motivation has definitely been beyond my expectations. (Interview 12)

Web logs provided further illustrations on how teachers felt students were more engaged in the learning process and remembering what they learned. One web log entry even expressed how students were so engaged with the lesson that they began finding related articles at home. Students wanted to start a letter writing campaign to local restaurants as the result of their learning about advertising schemes.

> My students had the opportunity to complete most of the scavenger hunt that I made in class last week. They were very excited! The best part was when I began to hear comments such as.... I remember this we talked about it in class! or Check this out! Click on this! (Web log 14)

> I am amazed at the way that my students are able to work independently on the computer this year. I am giving them an equal amount of computer based and written work, and they are really rising to the occasion. We are working independently in the classroom throughout the week, and then spending one hour on Thursday mornings in the computer lab. They are having very little difficulty completing their assignments. They are able to save things in their shared folder for me to find. They are also actively using my class website at home to visit sites and play games that I set for them based on our units of study. Since technology is going to be such an important part of their future, I believe that I am preparing them for a future of success…. They have spent the week looking at other advertisements and at the very neat PBS website Don't Buy It. My kids were

> amazed at the lengths that advertisers would go to impress would be consumers. One of my students even found an article in one of her mom's magazines about an advertising company that uses lipstick on the strawberries in its advertisements. They are really becoming interested in this topic…. They are ready to write letters to all the fast food restaurants in our area and demand to know what they do to the food in their commercials. I never dreamed this would affect them so much. I love to see my class get so involved in their learning though. I think that the [Name of Program] strategies and equipment that we have been given is to thank for that. This has been an amazing year! (Web log 3)

One Teacher expressed in her web log a concern for students' classroom placements in future years. They were specifically concerned about the impact on students who move from a classroom where technology is integrated frequently to a classroom where technology is not utilized frequently.

> The children have said they are sad that they won't be using these special technology tools next year. Only one of the first grade teachers are participating in [Name of Program]. (Web log 6)

Summary Question Three

Both quantitative and qualitative data indicate teachers had a positive experience with this technology related staff development initiative and the experience impacted their classroom instruction. Quantitative data indicated the staff development experience was effective in teaching skills necessary for integrating technology, motivating, and impacting teacher's teaching and learning philosophies. Qualitative data triangulated well with quantitative data showing more frequent technology integration, a feeling of rejuvenation or empowerment of teachers in their own teaching and learning, a change in teaching for the better, and more engaged students. Quantitative and qualitative data indicated teachers participating in this program were frequently integrating technology. Quantitative data related to effectiveness in teaching skills necessary for integrating technology relates with qualitative data indicating more frequent technology integration

because teachers indicated in items qualitatively analyzed that they were able to apply new skills. Quantitative data related to motivation can be triangulated with qualitative data indicating a feeling of rejuvenation or empowerment among teachers in their teaching and learning. Teachers indicated they were motivated to apply what they learned in the classroom because it engaged students as well as rejuvenated their own learning and teaching. Quantitative data on impact on teachers' teaching philosophies corresponded with qualitative data indicating that teachers felt their teaching had changed for the better and students were more engaged as a result. Quantitative data and qualitative data triangulate to show this staff development initiative appears to be effective in increasing teacher technology skills and technology integration within the classroom and qualitative data identified more student centered approaches to integrating technology.

CHAPTER 5

DISCUSSION

This chapter includes discussion of the match between program elements and previous research, interpretation of findings, and implications for future staff development on technology integration organized by research question. Suggestions for future research on this staff development program as well as technology staff development programs in general are also provided. The chapter concludes with sections focused on strengths and limitations, reliability, validity, and researcher's role and bias.

Organization of Technology Staff Development Program

The interview with the program director and the list of staff development program requirements indicate a good match between key elements of the program and the suggestions of previous research. The district's plan addressed Romano's (2003) six barriers to technology integration. The district had a clear vision to increase student engagement in learning via technology integration and required all participants to take a course on traits of 21st century learners as part of the initiative. Teachers were empowered through the various resources afforded them in their classrooms, a smorgasbord of course offerings to meet their individual learning and teaching needs, and through the provision of additional resources and training in response to teachers' individual capstone projects. The initiative respected teachers' vital role in educating children and assisted teachers in engaging students through various means of technology

integration. Technology integration spanned from teacher directed use of technology to review content knowledge to very student directed use of technology in which students produced products from their own active learning. Many software applications were available to teachers in order to enhance their curriculum. Leadership throughout the county was highly supportive of the endeavor.

School district decisions also matched Ringstaff and Yocam (1994) ACOT research. Situated learning was achieved by providing technology to teachers in their classrooms as part of the staff development initiative. As a result of these technology rich learning environments with continual access to technology, teachers were able to immediately apply what they learned in their own classrooms. Teachers were able to learn by creating their own technology samples within their classes which they could in turn use in their classrooms. School district personnel outlined specific plans for change in which the primary goal was to enhance teaching and learning. Teachers enrolled in the program knew the expectations set forth for them in the two year staff development program. Some courses as well as a capstone project were required, while in other courses and activities teachers could select from a variety of possibilities to fulfill the requirements of the program. Reflection was emphasized by means of a weekly web log entry. Peer support and ongoing assistance were also available, but those will be discussed further later in the chapter. In addition, the five elements from A Report on 10 Years of ACOT Research (1995) were also present within this staff development initiative. The first element of small-group collaborations among teachers was present in most schools. One teacher at a school with few teacher participants actually joined a collaboration of teachers at another school in order to receive peer support for her

capstone project as suggested by a technology support person who served both schools. The second element of teacher development in actual classrooms took place because all teachers enrolled in the classroom had their classroom equipped with the technology being taught. Because of this aspect of the training, teachers were able to immediately apply what they learned. The third element of staff development built on teachers' existing knowledge about curriculum and practice was present because teachers were able to select courses and projects which best met their learning and instructional needs as teachers. The fourth element of provision of opportunities to experiment and reflect on new experiences was present because of the availability of technology resources within teachers' classrooms. One respondent reported that one aspect of the initiative that she liked best was that she was able to try out what she learned in class in her classroom and then expand on her learning the following class session. The final element of provision of ongoing support to help implement change and innovation was also present, but will be discussed in more detail later in this chapter.

Question One:

How do Teachers Experience the Five Elements of Diffusion (Relative Advantage, Compatibility, Complexity, Triability, and Observability) in the Area of Technology Integration in Elementary Schools?

Discussion of Elements of Diffusion

All five elements of diffusion as described by Rogers (1995) were present in this staff development initiative. Data indicated that these elements helped make the staff development initiative effective in using technology to enhance elementary teaching and learning, the primary goal of the program. Five of the eight correlations to the item, *I*

frequently use technology ideas which I learned in a technology staff development class, were positively correlated to items indicating elements of diffusion. In addition, teacher interview and open ended responses to the online survey indicated teachers felt what they were learning was transferable to the classroom; they were rejuvenated; and students were more engaged. These findings are in line with the recommendations by Gahala (n.d.) and Whitaker (1995) that school district technology personnel and technology advisory committees should examine school needs and curriculum requirements prior to selecting technology hardware and software. Data from the project director interview confirmed this school district considered student learning objectives prior to developing this staff development program. This created an environment with high relative advantage and compatibility for teachers because it aided them in meeting district and state mandate learning objectives.

Relative Advantage and Compatibility

Relative advantage deals with the benefit of using a new method over an old method. Compatibility deals with a match between an innovation and the needs and values of adopters. Many aspects of relative advantage and compatibility were present in this staff development initiative. Some of these topics have been examined in research related to technology integration, but not defined in terms of elements of diffusion. Previous research (Abbot 2003; Becker, 2000; Carlson, 2002; O'Dwyer et al, 2004***;*** Sweet et al., 2004; Parks and Pisapia, 1994) addressed the following relative advantage and compatibility concerns which were also evident in the findings of this study: access, time, teacher background knowledge, and impact of testing pressure. This study found teacher choice in staff development opportunities and teachers' feelings that staff

development is practical and transferable to the classroom setting were also related to relative advantage and compatibility. Qualitative data in the form of teacher interviews and open ended responses to the online survey indicated teachers appreciated being able to choose which classes and projects to complete for this initiative because it allowed them to meet their individual learning and teaching needs. Qualitative data also indicated teachers felt what they were learning in staff development was highly transferable to their classroom. Quantitative frequencies showing frequent use of technology (Table 10) and a 97.5% agreement rate with frequent use of what was learned in staff development (Table 55) triangulate with qualitative data indicating teachers were transferring what they learned to the classroom.

The findings of this study are in agreement with Abbot (2003), Becker (2000), Carlson (2002), O'Dwyer et al (2004)**,** Sweet et al. (2004) and Parks and Pisapia (1994) who all attribute high access to technology as an indicator of technology integration. Data analysis indicated 96.3% of teachers had access to a minimum of five classroom computers, 98.8% of teachers had a ceiling mounted LCD projector and an interactive white board, and all teachers had a laptop for teacher use. In addition, 93.8% had access to a computer lab and 67.1% had access to a mobile laptop lab. Interactive student response systems were also part of the classroom technology set up as part of this initiative, but no data were collected on this technology. The majority of teachers either agreed or strongly agreed they always had the software and hardware taught in staff development courses readily available for use in their school, 82.3%, and 88.6% agreed or strongly agreed that technology was fixed in a timely manner when it was not working. This high access to technology created an environment with high relative advantage and

less complexity. Correlations indicated access to software and hardware positively correlated with motivation to integrate technology, learning new skills, frequently using ideas learned in staff development, and a change in teaching philosophy. Classroom access made technology convenient and less complex because technology was always connected and ready to use. Interviewee 3, in discussing previous access to technology said, “I had a projector in my room, but it was shared by everyone in the hallway. It wasn’t mounted [on the ceiling] so it was pretty much useless because by the time we got it out and got it set up it was more a pain than it was worth.” Given that in many schools technology resources are shared among multiple classrooms, this is an important factor to note as a hindrance to frequent technology integration. Although access to technology was high, several interviewees indicated they desired more computers in their classroom. The program appeared to be leading teachers to a desire for a one to one computing initiative.

Abbot (2003), Becker (2000), Carlson (2002) and O’Dwyer et al (2004) identified time as an issue in technology integration. Both quantitative and qualitative data indicated that time was an issue. The majority of teachers, 57%, felt they did not have enough time to plan technology integrated lessons and only 31.7% agreed or strongly agreed they had enough time to plan technology lessons. In addition, 39.2% felt they did not have enough time to learn new technology skills and 38% did feel they had enough time to learn new skills. Qualitative data indicated teachers felt they needed more time to develop flip charts for the interactive white boards and projects for their students. Although qualitative data revealed concerns for time, data also indicated that teachers appreciated that classes had time built in for them to make resources for their classroom

instruction utilizing the technology they were learning. Interviewee 11 captured teachers feelings about time when she said, “I think the main limit is just what teachers always complain about is time to plan, time to implement. This program has been real helpful with that because the classes we take have time built into them for building … so that has helped.”

Abbot (2003), Becker (2000), Carlson (2002) and O’Dwyer et al (2004) identified training and teacher background knowledge as key elements of creating technology rich learning environments. Training and teacher background knowledge go hand and hand in this initiative. An outcome of qualitative data analysis indicated teachers appreciated they were able to choose the courses which best met their learning and teaching needs. Teachers indicated that previous technology staff developments did not address their individual needs as much as this program. Some mentioned they were over qualified for previous technology staff developments or the content was not relevant to their grade level or special instructional needs for various students they teach. Several online survey respondents reported they were satisfied that teachers enrolled in the program had a degree of technology proficiency so they were not slowed down by less than proficient technology users. One interviewee also indicated a similar concern with the future of this program when teachers with less technology proficiency enroll in class. She was concerned with the impact more varied technology abilities among participants would have on classes. Qualitative data also indicated that teachers felt trainings were applicable and transferable to their classroom instruction.

Quantitative data indicated that over 68% of teachers disagreed or strongly disagreed they were taking classes on information they already knew and 87.4%

disagreed or strongly disagreed the courses were repetitive and did not offer opportunities to learn new programs. Correlations indicated that feeling frustrated with staff development because it is repetitive was negatively related to motivation to integrate technology and enjoying technology staff development. Over 80% of teachers felt they had local school technology staff development opportunities in addition to the district technology offerings.

A few teachers mentioned testing pressures, in particular the paper based nature of the test, as a reason they did not integrate technology even more frequently. This inhibitor is in line with Becker's (2000) research which states pressure of curriculum and high stakes testing can inhibit frequent technology integration.

Complexity

A reduction of complexity, an element of diffusion not discussed in previous research on teacher technology integration, was found in data analysis. For a new innovation to be adopted, complexity has to be reduced. Technology permanently set up in individual classrooms, reduced complexity by making technology easier to use without concern for checking out equipment from a central location or the need to prepare equipment for use. In addition, support personnel met with teachers to provide individual assistance according to teacher learning needs. This reduced complexity by differentiating instruction for teachers. Three items in the online survey measured complexity (Table 28) with over 80% of respondents agreeing that staff development simplified technology integration. Correlations were apparent between 21 of the survey items and the statement *Technology staff development I receive helps simplify technology integration for me.* A negative correlation between this item and the item *I feel frustrated*

by the complexity of technology when I participate in technology staff development indicates consistency in responses to the online survey. Positive correlations indicate a tie between staff development reducing complexity and staff development providing motivation to integrate technology, the highest correlation, and staff development being effective in teaching needed skills (Table 29). Open ended responses indicated the program made teaching easier and immediate access to the technology in their classroom helped them retain what they learned. One interview quotation illustrated how a permanent set up of the technology within the classroom reduced complexity.

Observability

Observability, another element of diffusion not referenced in previous teacher technology integration research, was also apparent in this initiative. Classrooms of initiative participants were labeled with signs notifying others they were part of this staff development program. In addition, all staff development participants had web pages on a county staff development web site. Because of the emphasis the school district placed on this initiative, observability of participants was emphasized. Interviewees felt the teachers who signed up for the second round of the staff development initiative did so in part because of seeing what was happening in the classrooms of those who were the initial participants in the program. Six survey items measured observability and resulted in a 40% to 90% agreement rate (Table 31). The item *I have opportunities to observe other teachers integrating technology in their classrooms* received the lowest agreement rate of items examining observability with slightly more than 40% or participants agreeing or strongly agreeing. Given the nature of schools and the difficulty in providing teachers opportunities to observe other teachers due to differing schedules among teachers, this

40% agreement rate is still a high agreement rate for this kind of observability. The 69% agreement rate with the item *Fellow teachers are available to model how to use software applications and/or hardware at my school* indicates fellow teachers are modeling technology for each other, but scheduling conflicts may be a reason for the 29% difference in the observability in someone's classroom versus modeling how to use technology which is not as confined to a school day schedule. Thirty of the 49 survey items positively correlated with the statement, *Technology integration is visible in my school* including 19 items associated with elements of diffusion, seven items associated with support, and four of the survey items which measured impact. Visibility showed correlations with staff development being motivating, staff development being effective in teaching needed skills, and frequently using ideas learned in staff development. Web log entries indicated teachers were able to attend technology conferences which increased their observability. However, one open ended online survey response indicated a frustration with lack of observability because of being one of only two teachers in her school enrolled in the program. All data sources stressed the importance of observability both in providing additional ideas for integration and in motivating other teachers to participate in future opportunities with the initiative.

Triability

Triability, an element of diffusion not mentioned in previous research on teacher technology integration was apparent in this staff development initiative. Teachers mentioned the access to technology in their classrooms during the staff development allowed them to try what they were learning in their classrooms. Because teachers were able to try the technology in their classrooms immediately, they were able to retain what

they were learning. Four questions on the online survey dealt with the element of triability (Table 38). The lowest report of triability consisted of over half of teachers reporting opportunities to go to demonstrations where technology can be tried. The highest reporting of triability, 94.8%, indicated teachers had the opportunity to try new technology in their school. A correlation was also apparent between being able to try new technologies and staff development motivating teachers to integrate technology (Table 57). Qualitative data, in the form of open ended responses and teacher interviews, indicated teachers appreciated the hands-on nature of the program and the ability to try what they were learning in their classroom between class sessions. They reported that this allowed them to try the new technology and then receive further assistance as needed during the next staff development class.

Implications for Staff Development Focused on Technology Integration

All data sources indicate elements of diffusion impacted this staff development experience. The correlation tables show elements of diffusion frequently correlated to items which measure the impact of the program on teachers. Elements of diffusion are correlated with increase in teacher motivation, effectiveness of staff development in teaching skills, and teachers frequently applying what was learned. All sources of qualitative data also indicate the benefits of the presence of elements of diffusion or concerns with the program because of a lack of element of diffusion.

Staff development programs focused on technology integration should be planned carefully in order to incorporate elements of diffusion. Many factors impact teachers' feeling of relative advantage and compatibility. Of particular focus should be grade level and/or subject area curriculum and developmental considerations that would make the

staff development transferable to individual teachers' instructional needs. In addition, provision of choice appears to lead to greater relative advantage and compatibility because this empowers teachers to take advantage of opportunities that meet their learning and instructional needs. The element of complexity can be addressed by carefully accessing equipment needs, and supplying equipment to teachers in such a way in which they are not complicated to utilize. The presence of observability can be utilized by providing ways in which ideas and work samples can be shared, such as the web pages utilized in this initiative, and by having multiple teachers within a school participate in staff development together so they have opportunities to observe other teachers' integration ideas. In addition, providing teachers with opportunities to attend technology conferences increases observability. Triability can be provided for by having opportunities for teachers to try new technologies both at the school level and through various demonstration in which teachers can try technology.

Question Two:

How do Teachers Experience Instructional Technology Support and the Impact of Support on their Technology Integration Instruction?

Discussion of Support

The structure of this staff development initiative provided multiple avenues for teacher support with technology integration. Teachers had access to peers and school based teacher mentors who were provided a stipend for their role as a site based mentor. They also had access to instructional and hardware technology support personnel assigned to multiple schools, instructors of technology classes, and various county level officials including the program director. Qualitative data indicated teachers knew whom

they could seek out for support and were able to receive support in classes they were enrolled in as well as individualized follow up support when needed. In addition a feeling of everyone, teachers and support personnel, being “in this together” was present. It was indicated that when support personnel did not know answers to questions immediately, they took the time to find answers in order to support teachers. Qualitative data also indicated teachers felt the support offered in this initiative was at a higher level than former staff developments. Peer support was frequently mentioned in qualitative data as a helpful aspect of the initiative. Both quantitative and qualitative data indicated teachers felt highly supported and that support impacted their technology integration. Correlations from online survey responses indicated a tie between support related statements and (a) frequently using ideas learned in staff development, (b) motivation to integrate technology, and (c) change in teaching philosophy. These correlations indicate that support is important in staff development that leads to instructional change and improvements.

In line with previous research indicating support as an important element in successful technology integration initiatives, support was an important aspect in the design of this staff development plan. Correlations and qualitative data analysis in this study indicated support played a role in teacher change in this initiative. These findings are consistent with previous studies. In *A Report on 10 Years of ACOT Research* (1995), two of the five elements that contributed to effective staff development for technology integration are support related. The two essential support elements were small-group collaborations among teachers and provision of ongoing support to help implement change and innovation. Ringstaff and Yocam (1994) and Parks and Pisapia (1994) also

identified peer support and ongoing assistance from technology personnel as important contributors to technology staff development success. Carlson (2002) advocated teacher training that includes ongoing pedagogical and technical support for teachers in order to address daily challenges of teaching. In addition, May (2000) and Davis (2002) found teachers who experienced mentoring and/or follow up support to technology training integrated technology more frequently than teachers without such support. It has also been documented that low teacher perception of support can negatively impact classroom technology integration (O'Dwyer et al, 2004).

Consistent with previous research (Hilliard, 1997; Thurlow, 1999; Dexter et al., 2003) this study found that support personnel can also lead teachers to change instructional practices. Hilliard (1997) stated that a positive relationship between staff developers and teachers aid in teacher growth and implementation of new strategies within the classroom. Thurlow (1999) found teachers who most frequently integrated technology placed a high value on one-on-one training and were 40% more likely to begin using computers because of the suggestion of a technology coordinator rather than their own initiative. In addition, Dexter, Seashore, and Anderson (2003) found that technology specialists were important in providing both support and subtle pressure for change. In the current study, both quantitative and qualitative data indicated that support was critical to teacher adoption of technology in the classroom.

Even though the staff development initiative included high levels of support, a desire for even more support was present among participants. Over 70% of online survey respondents indicated they felt that a technology support person who could visit their classroom when needed and help them with integrating new software for the first time

would make them more likely to integrate technology, and over half of respondents wished they had someone to demonstrate technology rich lessons within their classrooms. These quantitative findings triangulated with qualitative data from the online survey which stated a desire for more access to individualized support.

Other support related concerns mentioned in qualitative data included, timeliness of repairs, knowledge base of school based mentors, and issues with network security limiting teachers. It should be noted that these concerns were each stated only once in qualitative data and 88% of teachers felt repairs were made in a timely fashion.

Implications of Support for Staff Development Focused on Technology Integration

Support helped make this staff development initiative effective. Teachers reported the level of support was beyond any other staff development initiative they had experienced and felt they had access to support personnel whenever needed. Teachers indicated they knew where to go to for support whereas before they may not have known whom to contact with support needs. Teachers also indicated peer support was important in the success of this program. Having peers to go through the program together aided teachers in the learning process and helped them generate technology integration ideas for their classrooms. Support was a strength in this staff development initiative and data indicate that when planning for technology staff development, a support structure should be considered. This multi-layered support structure should include how support will be provided during classes for teachers, after classes have ended, and how both technical and instructional support staff will continue to support teachers and their classroom technology integration. The support structure should provide clear communication channels enabling teachers to seek out support when needed. Another consideration is

how teachers are selected to participate in a staff development initiative. With peer support being a contributing factor to teacher learning, teachers benefit from at least three teachers within the same school taking part in staff development together.

Question Three:

How do Teachers Experience Technology Staff Development and the Impact of Staff Development on their Classroom Technology Integration?

Discussions of Impact on Technology Integration

The staff development program not only impacted teachers' classroom technology integration, but also rejuvenated the participants as teachers. Qualitative data indicated teachers were engaged in the learning process and even though they faced challenges when learning new technology applications, they felt a sense of accomplishment when they progressed in the new skills they were acquiring. Both quantitative and qualitative data indicated the staff development program was effective in teaching necessary technology skills and providing motivation to integrate technology. Frequent technology integration was noted (Table 10). Data also indicated changes in teaching philosophy and a progression towards more student centered learning. Qualitative data provided examples of how teachers observed students becoming more engaged in the learning process, even students with special learning needs and very active students.

Findings are consistent with Baker et al. (1990) in which teachers reported a positive impact on their job interest and performance, and began to view students' roles in the learning process differently. Teachers' mentioning of more engaged students is consistent with Sandholtz et al. (1994) research which noted positive changes in student engagement and Bryant's (2003, 2004) studies indicating that students found computer

use to be playful even when pursuing academic tasks. Teachers' indication of change in teaching philosophy and more student centered approach is consistent with the Dwyer et al. (1990) Apple Classrooms of Tomorrow research, indicating teachers progress through various stages of technology integration in which each stage becomes more student centered as they become more proficient with technology.

Implications of Impact for Staff Development Focused on Technology Integration

The findings in this study indicate this staff development model was effective in leading to frequent and higher levels of technology integration. The findings of this section cannot be examined in isolation from the sections on elements of diffusion and support because those aspects were frequently recognized in quantitative data as correlating with impact on classroom practice and in qualitative data as factors which contribute to teacher technology integration. The following subsections explain implications of the study findings for technology staff development.

Staff Development Should Allow for Teacher Choice. Of important consideration in the qualitative data set was the emphasis teachers placed on choice both to participate in the program and to select the means, classes and projects, by which they were going to meet the requirements of the program. This is of particular importance, given recent legislation in Georgia which required all teachers to have a minimum of 50 professional learning hours in the area of technology integration from a limited selection of courses in order to have their certification renewed. This certification renewal requirement held a deadline of Summer 2006 for teachers, and for many this requirement was fulfilled through a 50 hour software overview course entitled InTech. Qualitative data referencing this past course, indicated frustration because the content was already familiar, not

transferable to their grade level or subject area, or because content was covered rapidly not allowing for retention. Staff development programs should be developed around a clear objective and then offer various courses which address the objective. This would allow teachers to participate in classes which meet their learning and instructional needs.

Staff Development should be Transferable to the Classroom Setting. Qualitative data indicated teachers' appreciation for the ability to enroll in classes which met their students' needs. Staff development should offer an array of courses which address the varied teaching and learning needs of teachers. The K-12 environment has various development and instructional objectives which must be met and therefore courses should be designed to meet these more specific age and content level needs.

Staff Development Should Include Classroom Access to Technology Taught. Quantitative and qualitative data indicated high levels of access to technology and this access was linked to classroom technology integration. Qualitative data also indicated that access needs to involve ease of use of the technology. One teacher provided the example that a LCD projector was not commonly used when it was assigned to multiple classrooms because of the time it took to reserve and set up the projector before starting the lesson. She contrasted this situation to the easy use of a ceiling mounted projector which simply required using the remote to turn it on. Also teachers indicated because they had classroom access to the software and equipment they were learning, they were able to immediately use skills learned, leading to retention of these skills. Qualitative data also indicated as teachers became more proficient in integrating technology they desired greater levels of access.

Staff Development Needs to Provide Time for Practice and Creation of Lessons which can be utilized in the Classroom. Data indicated time is an issue which can inhibit technology integration. Quantitative data collected about time had some of the most varied responses indicating a wide degree of teachers' perception of time to learn new skills and plan lessons which integrate these skills. Qualitative data indicated teachers appreciated when classes had time built in for them to create lessons in class with the support of someone familiar with the program being learned. After basic software and hardware skills are learned, this aspect of staff development could be aided by allotting time for teachers to collaborate on building more technology rich, curriculum based lessons during staff development days.

Staff Development should Provide Ample Support to Teachers. This support should address both the technical and instructional needs of teachers. The support structure should have clear channels of communication. Qualitative data indicated teachers appreciated knowing whom to contact for what needs. The support structure needs to provide timely repairs to non working technology and timely answers to teachers' software and hardware questions so technology can be integrated. This may require the addition of staff and/or a more focused utilization of current staff.

Staff Development should Emphasize Collegiality. Quantitative and qualitative data indicated high levels of peer support. Qualitative data further emphasized the positive aspects of peer support during professional learning. This peer support helped teachers with issues which they encountered and provided a network of people to assist with lesson ideas. As a negative example, one teacher indicated frustration with a lack of

peers with whom to collaborate because she was one of only two teachers in her school participating in the program.

Recommendations for Future Research

This study involved a staff development program in which elements of diffusion and support were both present. Future research focusing on comparative analysis of other staff development programs could inform how lack of support and presence of elements of diffusion impact classroom technology integration. Such research could further substantiate the effectiveness of the model of technology staff development used in the current study.

Recommendations for Further Study of this Staff Development Program

This study was conducted at the end of year one of a two year staff development program. Because the first year involved a larger learning curve for teachers and patience with installation of new technology within their classroom, a follow up study examining the impact on teachers in the second year is warranted. How did technology integration change in the second year of the initiative? What skills did teachers feel they needed to expand upon? What was the impact of the capstone project on teachers, students, parents and other school stake holders? In addition, impact of the program on future groups of participants could be studied and compared to the initial group of participants. In addition, future research could study the implications of using this first group of teachers as peer coaches for peers within their school.

Funding is an issue in the realm of school technology. Future studies could focus on how this initiative influenced public perception of technology integration and if this influence increased a desire among the public to pass technology driven tax initiatives. In

addition, future studies could be conducted to examine how this initiative prepared teachers and the public for one-to-one computing initiatives and more technology rich resources as opposed to traditional resources such as text books.

Recommendations for Further Study of Technology Staff Development Programs

Future research can examine how the provision of choice to participate in a staff development program allows for a natural cycle of adoption in which innovators and early adopters participate in the program first, providing observable models for late adopters. A comparison study could be conducted on the impact of programs which allow choice with programs which are required for everyone. Programs involving choice to participate are perhaps more likely to involve a natural adoption cycle in which innovators and early adopters participate first, with late adopters and laggards choosing to participate after they see the benefits others receive.

The fact that participants who self-identified as innovators (44.3%) and early adopters (38%) appeared to require high levels of support suggest the need for further research to study the level of support needed by various types of adopters. Will support be an even more critical component among teachers who are late majority or laggard adopters? Will the peer support and visibility of innovators and early adopters help lead late majority adopters and laggards down the path to technology integration? Will support staff have to be expanded in order to meet the needs of less enthusiastic adopters? Will style or kind of support need to be varied for different kinds of adopters? Email was a large part of the support system in this initiative. Will support have to involve even more face to face instruction among later adopters?

Future studies could be conducted utilizing the survey instrument used in this study. These further studies could help with understanding of the impact of elements of diffusion and support on technology staff development. In addition, future use of the survey instrument could lead to refining of the survey in order to create a normed survey for examining the presence of the elements of diffusion and support in staff development programs.

Strengths and Limitations

Strengths of this study include multiple data sources with an adequate sample size for both quantitative and qualitative data sources. The consistency of responses across both quantitative and qualitative data sources also indicates a degree of internal reliability. Lack of researcher involvement in the studied program can be viewed as a strength in the quantitative data collection and analysis process, but a limitation in qualitative data collection and analysis. Other limitations in the study involve the reality that baseline or pre data could not be collected because the initiative had already started prior to the beginning of this study. Also, because teachers had to apply to be a part of the initiative, a random sample was not possible. Teachers participating in the initiative were more likely to be earlier adopters of technology than teachers who did not apply based on self reported adopter category classification by participants. Reliability and validity of the survey was a limitation because the survey was not a normed instrument used in previous studies.

Reliability of Data

As mentioned in the beginning of chapter three, this study was conducted utilizing a researcher-designed survey because of lack of a normed survey that measured elements

of diffusion and support and the impact these have on teacher technology integration. Whenever a new survey is developed, reliability can become an issue, especially with the first administration of the survey. A pilot of the survey using teachers in a different school district than the one studied was administered to check for clarity of items. Teachers indicated the survey items were clear with the exception of one misspelling (*to* instead of *too)* and two items that needed to be scaled responses instead of yes and no responses. Test-retest reliability analysis was not practical and since the survey did not measure one construct, internal consistency was not measured. Further use of the survey can produce reliability coefficients by examining reliability between administrations of the survey using a test, retest method for estimated reliability. Another method of testing reliability is to check for internal consistency among questions asking about the same content using Cronbach's Alpha. The survey developed for this research measured various constructs as suggested by clusters of intercorrelations. Further development of the survey could involve calculating Cronbach's Alpha within these clusters. Even though Cronbach's Alpha was not utilized during this study, general internal consistency is apparent in correlations and frequencies within this study. For example the survey items, *I feel frustrated in technology related staff development because I feel I am taking a class on information I already know* and *I feel technology related staff development is repetitive and does not offer opportunities to learn new programs* showed similar agree/disagree responses (Table 12) and positively correlated with each other at the .658 level (Table 14) showing a degree of reliability in the survey. High correlations between the item *In addition to county staff development opportunities, my school offers technology related staff development* and *Technology integration ideas are shared during*

faculty meetings and/or local school meetings at my school (.585) and *Technology integration is often part of local school staff development* (.472) also indicate a degree of reliability in the survey.

Although reliability is not typically a focus of qualitative studies, the mixed methods nature of this study warrants examining how one set of data relates to the other sets of data. The consistency of findings via qualitative sources of interview, open ended responses, and teacher web logs and quantitative data as examined in frequencies and correlations also infers reliability of data in this study.

Validity of Data

In both quantitative and qualitative data collection and analysis, validity of data is important. The survey instrument has face validity in that the questions related to elements of diffusion and levels of support were influenced by the researched literature. Concerning qualitative data collection and analysis, there are differing views on how validity should be expressed. Lincoln and Guba (1985) use the term trustworthiness in place of validity when discussing qualitative data and demonstrate trustworthiness in the four aspects of credibility, confirmability, dependability, and transferability. Credibility of data in this study is based on using multiple sources of data for coding of themes. The appearance of the same themes across multiple data sources from the same and differing participants makes the data analysis more creditable. Confirmability of data deals with the conclusions of the researcher being based on the actual data and was achieved in this study by the researcher carefully collecting and analyzing the data while acknowledging her own subjective thoughts. Confirmability of data was achieved in this study by providing an audit trail of data, data analysis, and interpretations of data. The audit trail

includes copies of all raw data analyzed, coded, and collapsed into clusters of meaning. Dependability of data is achieved when the researcher provides the audience with a description of how the research developed over time and any changes in methodology that occurred based on the data collection. Data were collected and analyzed as described by the researcher prior to beginning the study. No changes in methodology occurred during the study. Transferability is achieved through description of the participants, settings, and data collected within the study in such a way that a reader can determine if the findings of one study would be transferable to another setting based on these descriptions. This study includes as much demographic data as possible while still trying to protect participants.

Creswell (2007) focuses on eight common validation strategies in qualitative research. They are prolonged engagement and persistent observation, triangulation, peer review, negative case analysis, clarifying researcher bias, member checking, thick descriptions, and external audits. Triangulation occurred by using both quantitative data and multiple qualitative data sources including open ended survey questions, online reflections journals, and interviews. The appearance of themes across data sources and methods of data collection allowed triangulation of data to occur and made for stronger credibility of data. Negative case analysis occurred as the researcher found and documented statements within data sources that did not fall in line with coded themes or developing patterns used to make implications from the research. Researcher bias was outlined before the beginning of the study and is described in the following section of this chapter. Member checking was achieved by emailing codes and preliminary findings to teachers participating in oral interviews. Descriptions were provided about participants

and the initiative they participated in so readers can determine whether the study would be transferable to another setting. An external audit was not be used for this study, but an audit trail consisting of filed documents is available to track the research process and the conclusions from the multiple data sources.

Researchers Role and Bias

The researcher was an outside investigator in this study. She did not have any direct connections with the program being studied or the participants in the study. Because the researcher did not work within the school system being studied and did not personally know any of the participants, the researcher's role did not have any influence on participants or quantitative data. The teachers had previously posted their material before becoming participants in this study. Although prolonged engagement, a strength of qualitative research was not possible, the weekly web log entries which spanned from the beginning of the initiative through the completion of the first year of the initiative provided prolonged data.

The researcher's biases and assumptions in this study stemmed from her own experiences with technology integration as a high school student, university student in a computer for educators class, an elementary classroom teacher, an elementary computer lab teacher, staff development instructor, and college instructor for a technology-for-educators class. All of these experiences added to the researcher's understanding of types of technology available to enrich educational experiences for students and the challenges limited access to software, hardware, and support personnel can have on teachers.

Conclusions

Data analysis from this study of a school district technology staff development program resulted in an in depth understanding of the impact of elements of diffusion (Rogers, 1995) and support on classroom technology integration. Data collected from all sources, online surveys, interviews, and web logs indicated: (a) teacher growth, (b) renewed excitement for teaching, (c) increased student engagement, and (d) frequent technology integration. These consistent findings are strong indicators of the successfulness of this program. Given the effectiveness of this program and the need to better develop teachers abilities to integrate technology, replication of this program is warranted.

The presence of elements of diffusion created an environment which made technology integration and teacher learning applicable to instructional practice. The presence of on-going support made teachers comfortable asking questions to expand both their technology skills and instructional skills. The presence of collaboration among peers allowed teachers to share instructional ideas and technology tips. The presence of choice in participation, created an eager crowd of participants who were mostly self-reported innovators and early adopters.

This research contributes to the knowledge base of elements present in effective technology related staff development. A mixed method approach allowed for a deeper understanding of how the technology staff development program impacted teachers and their integration of technology. This study informs how planning for the presence of elements of diffusion and an on-going support structure for teachers involved in technology staff development positively impacts teachers and classroom instruction. The

study also adds to the body of research by revealing how teacher choice in staff development participation, not an anticipated finding, has positive benefits on teacher learning and instructional practice. In addition to the contributions to research, the positive findings of this study indicate this school district's technology staff development plan could be used as a model for other schools and districts trying to improve technology integration.

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APPENDIXES

Appendix A

Technology Foundation Standards for All Students 1998

The technology foundation standards for students are divided into six broad categories. Standards within each category are to be introduced, reinforced, and mastered by students. These categories provide a framework for linking performance indicators within the Profiles for Technology Literate Students to the standards. Teachers can use these standards and profiles as guidelines for planning technology-based activities in which students achieve success in learning, communication, and life skills.

1 Basic operations and concepts
- Students demonstrate a sound understanding of the nature and operation of technology systems.
- Students are proficient in the use of technology.

2 Social, ethical, and human issues
- Students understand the ethical, cultural, and societal issues related to technology.
- Students practice responsible use of technology systems, information, and software.
- Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.

3 Technology productivity tools
- Students use technology tools to enhance learning, increase productivity, and promote creativity.
- Students use productivity tools to collaborate in constructing technology-enhanced models, prepare publications, and produce other creative works.

4 Technology communications tools
- Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.
- Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.

5 Technology research tools

- Students use technology to locate, evaluate, and collect information from a variety of sources.
- Students use technology tools to process data and report results.
- Students evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.

6 Technology problem-solving and decision-making tools
- Students use technology resources for solving problems and making informed decisions.
- Students employ technology in the development of strategies for solving problems in the real world.

Educational Technology Standards and Performance Indicators for All Teachers

Building on the NETS for Students, the ISTE NETS for Teachers (NETS•T), which focus on preservice teacher education, define the fundamental concepts, knowledge, skills, and attitudes for applying technology in educational settings. All candidates seeking certification or endorsements in teacher preparation should meet these educational technology standards. It is the responsibility of faculty across the university and at cooperating schools to provide opportunities for teacher candidates to meet these standards.

The six standards areas with performance indicators listed below are designed to be general enough to be customized to fit state, university, or district guidelines and yet specific enough to define the scope of the topic. Performance indicators for each standard provide specific outcomes to be measured when developing a set of assessment tools. The standards and the performance indicators also provide guidelines for teachers currently in the classroom.

1 TECHNOLOGY OPERATIONS AND CONCEPTS.
Teachers demonstrate a sound understanding of technology operations and concepts. Teachers:
- demonstrate introductory knowledge, skills, and understanding of concepts related to technology (as described in the ISTE National Education Technology Standards for Students)
- demonstrate continual growth in technology knowledge and skills to stay abreast of current and emerging technologies.

2 PLANNING AND DESIGNING LEARNING ENVIRONMENTS AND EXPERIENCES.
Teachers plan and design effective learning environments and experiences supported by technology. Teachers:
- design developmentally appropriate learning opportunities that apply technology-enhanced instructional strategies to support the diverse needs of learners.
- apply current research on teaching and learning with technology when planning learning environments and experiences.
- identify and locate technology resources and evaluate them for accuracy and suitability.
- plan for the management of technology resources within the context of learning activities.
- plan strategies to manage student learning in a technology-enhanced environment.

3 TEACHING, LEARNING, AND THE CURRICULUM.

Teachers implement curriculum plans that include methods and strategies for applying technology to maximize student learning. Teachers:

- facilitate technology-enhanced experiences that address content standards and student technology standards.
- use technology to support learner-centered strategies that address the diverse needs of students.
- apply technology to develop students' higher order skills and creativity.
- manage student learning activities in a technology-enhanced environment.

4 ASSESSMENT AND EVALUATION.

Teachers apply technology to facilitate a variety of effective assessment and evaluation strategies. Teachers:

- apply technology in assessing student learning of subject matter using a variety of assessment techniques.
- use technology resources to collect and analyze data, interpret results, and communicate findings to improve instructional practice and maximize student learning.
- apply multiple methods of evaluation to determine students' appropriate use of technology resources for learning, communication, and productivity.

5 PRODUCTIVITY AND PROFESSIONAL PRACTICE.

Teachers use technology to enhance their productivity and professional practice. Teachers:

- use technology resources to engage in ongoing professional development and lifelong learning.
- continually evaluate and reflect on professional practice to make informed decisions regarding the use of technology in support of student learning.
- apply technology to increase productivity.
- use technology to communicate and collaborate with peers, parents, and the larger community in order to nurture student learning.

6 SOCIAL, ETHICAL, LEGAL, AND HUMAN ISSUES.

Teachers understand the social, ethical, legal, and human issues surrounding the use of technology in PK-12 schools and apply those principles in practice. Teachers:

- model and teach legal and ethical practice related to technology use.
- apply technology resources to enable and empower learners with diverse backgrounds, characteristics, and abilities.
- identify and use technology resources that affirm diversity
- promote safe and healthy use of technology resources.
- facilitate equitable access to technology resources for all students.

Appendix B

National Staff Development Council Standards

Context Standards

Staff development that improves the learning of all students:

- Organizes adults into learning communities whose goals are aligned with those of the school and district.
- Requires skillful school and district leaders who guide continuous instructional improvement.
- Requires resources to support adult learning and collaboration.

Process Standards

Staff development that improves the learning of all students:

- Uses disaggregated student data to determine adult learning priorities, monitor progress, and help sustain continuous improvement.
- Uses multiple sources of information to guide improvement and demonstrate its impact.
- Prepares educators to apply research to decision making.
- Uses learning strategies appropriate to the intended goal.
- Applies knowledge about human learning and change.
- Provides educators with the knowledge and skills to collaborate.

Content Standards

Staff development that improves the learning of all students:

- Prepares educators to understand and appreciate all students, create safe, orderly and supportive learning environments, and hold high expectations for their academic achievement.
- Deepens educator's content knowledge, provides them with research-based instructional strategies to assist students in meeting rigorous academic standards, and prepares them to use various types of classroom assessments appropriately.
- Provides educators with knowledge and skills to involve families and other stakeholders appropriately (NSDC, nd)

Appendix C

Technology Projects

Points Awarded	Integrating Technology into standards-based Teaching
	Required Projects
15	Electronic Whiteboard Flipcharts(Promethean) or Lessons (SMART)
30	Capstone - Technology Integration Project
8	Professional Reading (To Be Completed in Engaged Learning Course) Current Article Reflections and Responses
	Elective Projects
10	-Locate/Find information Create and integrate an Internet Scavenger Hunt with students
Maximum of 2	A Scavenger Hunt is a list of questions for students to research on the Web. The Scavenger Hunt should include a list of links for students to use to conduct their research. This helps to focus student research and to prevent students from wasting class time searching unproductively on the Web.
15	- Use/Apply information Create and integrate an Web Quest with students
Maximum of 2	A WebQuest is an inquiry-oriented activity in which some or all of the information that learners interact with comes from resources on the Web. A well-written WebQuest demands that students go beyond fact-finding. It asks them to analyze a variety of resources and use their creativity and critical-thinking skills to derive solutions to a problem. The problem is often “real world”—that is, one that needs a genuine and reasonable solution.
5	Student participation in an Internet Project
Maximum of 2	Sharing a class project (information and collected data or results) with other classes around the world using the Internet.
15	- Share/Publish information Create and integrate an Internet Project with students
Maximum of 2	Sharing a class project (information and collected data or results) with other classes around the world using the Internet.

5	Integrating iSafe Curriculum with Students
Maximum of 1	
	Technology Resource Bank - Share/Publish resources
5	Publish standards-based MovieMaker Project
5	Publish formative assessment presentation using student response devices
5	Publish 3 standards-based lessons that include technology resources using Learning Focused Toolbox online lesson builder
5	Publish and assign 3 standards-based lessons in Knowledge Box
5	Identify and assign 3 standards-based videos for student access via an internet connection using Assignment Builder on United Streaming Video site
5	Integrate a standards-based electronic poster project with your students using primary sources. (Created in Make History Come Alive! Finding & Using Primary Sources course)
5	Author and publish 5 assessment rubrics for student self-evaluation.
	Class materials posted on teacher website
5	Presentations, Notes, Examples, etc.
5	Daily Homework or Class Assignments Posted
5	Monthly Class News or Newsletter
5	Links to Internet sites for remediation or enrichment
	Documented use of school technology resources with students
	Download Technology Resource Log Here
	Examples:
7	7 hours using online reference materials with students e.g. Netrekker, Grolier, GALE, GALILEO
3	3 hours using Test Prep software with students e.g. SAT Online, USA Test Prep, Online Assessment System
10	10 hours Using Hardware with Students e.g. Computer labs, mobile labs, TI Navigator

Appendix D

Technology Courses

Required Courses

Using Electronic Whiteboards to Engage 21st Century Learners: Promethean 101

Using Electronic Whiteboards to Engage 21st Century Learners: Promethean 102

Using Electronic Whiteboards to Engage 21st Century Learners: Smart Board 101

Using Electronic Whiteboards to Engage 21st Century Learners: Smart Board 102

Engaged Learning in [School System] County Schools

Choice of Courses

Asking the Right Questions: Internet Scavenger Hunts

Digital Storytelling with Movie Maker and Photo Story

Engaging Students through Online Resources

Excelling in Excel

Helping Students Find Their Way: Pathfinders and the Big6

Inquiry-Based Activities with WebQuests

Learning Essentials with Microsoft Office Products

Make History Come Alive! Tinding & Using Primary Sources

Podcasting for Educators

Project Based Learning: Preparing Students for the 21st Century

Tools of the Trade: Geometer's Sketchpad

Scaffolding with Technology

Appendix E

Capstone Action Research Proposal 2007-2008

Name:
School:
Subject/Grade Level:
Projected Date(s) of Implementation:

Focus Statement:
Research Questions:
Importance of Study:
Background Information:
Attach 2 to 3 page document summarizing research or current readings you find relating to the technology being used in your project.
Procedures:
Data Collection/Assessment/Evaluation Instruments:

Technologies Used:
Technologies Needed to Implement this Project:

Product	Quantity

Technology funds can be used only for hardware or software purchases. If your project requires other supplies, your school will have to agree to fund these purchases.

Supplies to be Purchased with School funds	Quantity

Please consider any special permission required to complete this project with students. Please list those for your principal's consideration.

Permissions Needed		

Applicant _____ Date:
Signature

Technology Mentor _____ Date:
Signature

Principal _____ Date:
Signature

Principals,
You may attach comments. Please send completed application to the office of Assistant Superintendent Accountability, Technology, and Strategic Planning by **March 30, 2007**.

Capstone Standards-Based Project Proposal 2007-2008

Name:
School:
Subject/Grade Level:
Projected Date(s) of Implementation:
Project Title:
Standard(s) Addressed:
Essential Question:
Lesson Essential Questions:
Procedures:
Technologies Used:
Technologies Needed to Implement this Project:

Product	Quantity

Student Work To Be Produced:
Evaluation/Assessment Procedures:
LoTi Level (beginning of Teach21 program):
Perceived LoTi Level of this project:
(Use the Capstone Rubric available on the Teach21 web site to determine the LoTi Level.)
Attach 2 to 3 page document summarizing research or current readings you find relating to the technology being used in your project.

Technology funds can be used only for hardware or software purchases. If your project requires other supplies, your school will have to agree to fund these purchases.

Supplies to be Purchased with School funds	Quantity

Please consider any special permission required to complete this project with students. Please list those for your principal's consideration.

Permissions Needed		

Applicant _____ Date:
Signature

Technology Mentor _____ Date:
Signature

Principal _____ Date:
Signature

Principals,
You may attach comments. Please send completed application to the office of Assistant Superintendent Accountability, Technology, and Strategic Planning by **March 30, 2007**.

	Capstone Project Rubric	
Category	**Descriptors**	**Please circle one for each category**
Higher Order Thinking (Bloom's)Level	Knowledge	1
	Comprehension	2
	Application	3
	Analysis	4
	Synthesis	5
	Evaluation	6
Engaged Learning Level	Teacher centered classroom: the students listen and the teacher directs Teacher/text generated content Assessment consists of standardized or teacher created forms Students work individually	1 2
	Student centered classroom: teacher is coach or facilitator Student is involved in setting goals, choosing tasks, etc. Student is involved in the creation of the evaluation tool and has input in the evaluation process Collaboration with peers and in groups	3 4
	Applied learning/student interested and engaged Frequent feedback evidenced throughout the process Collaboration outside the classroom with experts or communities, nationally and internationally Students encouraged to teach others	5 6

Authenticity Level	No product produced Technology is used for drill and practice (right and wrong answers)	1 2
	The product produced is very structured and fact oriented Technology used is to find or show evidence of factual information	3
	The product produced has no predictable outcome Technology is used to gather data for application, analysis, synthesis or evaluation on a routine basis.	4
	Many people will use/care about this product and student(s) may even make a significant contribution to society	5 6
Technology Used	Technology is used for drill and practice or simple word processing	1
	Technology is used as an enrichment activity with little integration into the curriculum	2
	Technology is used as a tool to augment instruction including the use of databases, spreadsheets, probes, multimedia applications, desktop publishing, etc.	3
	Technology is used as a tool to augment instruction but relies on prepackaged materials or outside sources (e.g. type in the numbers and see the results)	4a
	Technology is used in a routine manner as a tool to aid the student to construct their own knowledge and solve problems	4b
	Technology is extended beyond the classroom walls by networking with other students, experts, businesses, universities, etc.	5
	Technology is a process used to produce a product related to a "real-world" problem or issue. A vast array of technology-based tools are used to accomplish this particular task.	6

Appendix F

Teacher Technology Integration Questionnaire

Teacher Demographics:

School & District: _____

Gender:	Male					Female			
Grade Level:	K	1	2	3	4	5			
Age:	21-24	25-29	30-34	35-39	40-44	45-49	50-54	55-60	60+
Education:	Bachelor's		Master's		Specialist		Doctorate		
How long have you taught?	1-3 Years	4-5 Years	5-10 Years	10-15 Years	15-20 Years	20-25 Years	25-30 Years	30+ Years	
Do you have a computer at home?	Yes				No				
Do you have Internet at home?	No	Dial Up Access		DSL or Cable Access		Access, but don't know what type			
Are you full or part time?	Full Time			Part Time					

Frequency of computer use for personal or school related items which **does not include integrating technology with students in the classroom** (ex: grade sheets on a computer, creating class newsletters, etc). The example programs are just examples. The questions are not limited to those software programs.

	Daily	Once a week	Once a month	Once a semester	Never
How often do you use a computer?					
How often do you use a word processing software (ex: Microsoft Word)?					
How often do you use a spreadsheet program (ex: Microsoft Excel)?					
How often do you use a presentation program (Ex: Microsoft PowerPoint)?					
How often do you use electronic mail (e-mail)?					
How often do you use the World Wide Web (internet)?					
How often do you use instant messaging?					
How often do you blog or use some other type of internet based journal or communication with friends?					
How often do you order merchandize online (ex: Amazon.com or retail store)?					

Frequency of Personal or School Related Computer Use **not including integrating technology in the classroom with students**

	0 hours per week	1-4 hours per week	5-10 Hours per week	10+ Hours per week
How many hours do you use a computer at home?				
How many hours do you spend on the Internet at home?				
How often do you use a computer at school?				
How many hours do you spend on the Internet at school?				

Technology Training Background:

	Yes	No
Did you take Intech?		
Did you take a technology course as part of your undergraduate teacher preparation?		
Did you take a technology course as part of your graduate degree?		
Please list all technology courses you have taken, including the location below.		

Technology Staff Development Course Location

Quality of Technology Staff Development:

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
I frequently use technology ideas which I learned in a technology staff development class.					
I feel that technology related staff development often moves to fast for me to learn the skills which I need.					
I feel supported with technology integration even after a technology staff development opportunity has ended.					
I feel technology related staff development motivates me to integrate technology in my classroom.					
I enjoy technology related staff development.					
I feel frustrated in technology related staff development because I feel I am taking a class on information I already know.					
I feel technology related staff development is repetitive and does not offer opportunities to learn new programs.					
I often am excited about technology when I take technology related staff development, but am not able to take what I learn in the staff development and apply it to my classroom.					
I feel a technology support person who could visit my classroom when needed and help me with integrating new software for the first time would make me more likely to integrate technology.					
I always have the software programs (KidPix, Word, etc) or hardware (scanner, digital camera, etc) which is taught in staff development courses readily available for my use in my school.					

Technology Available for Instructional Purposes

	Yes	No
I have a school issued laptop which I can use at home and school.		
I have an LCD projector in my classroom.		
I have a Smart Board or Active Board in my classroom.		
I have a TV in my classroom.		
I have a DVD player in my classroom.		
I have a VCR in my classroom.		
I have a digital camera I can use in my classroom.		
I have an overhead projector in my classroom.		
I have internet access in my classroom.		
I have access to a lab or laptop cart for student use during technology integrated lessons?		

How many computers do you have in your classroom?	1	2	3	4	5+
What is the average age of the computers in your classroom?	Less than 2 years old	3-4 years old	5+ years old		
How often do you integrate some kind of computer technology with your students in your classroom?	Daily	Once a week	Once a month	Once a semester	Never

Please check Software you use with students in your classroom.

__	Microsoft Word	__	Inspiration		
__	Microsoft PowerPoint	__	Kidspiration	__	Internet
__	Microsoft Excel	__	Timeliner	__	**Other Software**
__	Microsoft Publisher	__	Success Maker	__	_____
__	Microsoft FrontPage	__	Accelerated Reader	__	_____
__	KidPix	__	Accelerated Math	__	_____

Frequency of Types of Technology Integration

These questions are specific to your classroom. Only include those activities which are lead by you the teacher (this can include times when you receive support teaching these lessons). Do not include what the students do while in the presence of another teacher (computer lab specials rotation, etc) without you present during the lesson.

	Daily	Once a week	Once a month	Once a semester	Never
How often do students use a word processing or graphic organizer software in your classroom (ex: Microsoft Word, Inspiration)?					
How often do students use a spreadsheet or graphing program in your classroom (ex: Graph Club, Table Top, Microsoft Excel)?					
How often do students use a multimedia program in your classroom (Ex: Microsoft PowerPoint, KidPix, Hyperstudio)?					
How often do students use electronic mail (e-mail) in your classroom?					
How often do students use the World Wide Web (internet) in your classroom?					
How often do students use instant messaging or video conferencing to communicate with students in other places in your classroom?					
How often do students use a class blog in your classroom?					
How often do students use skill related software (Accelerated Reader, Reading or Math skill related software, etc) in your classroom?					
How often do students use assessment software in your classroom (Scholastic Reading Inventory, CRCT preparation, etc)?					
How often do you teach utilizing an LCD projector to project computer images on a screen in your classroom?					
How often do you teach utilizing a Smart Board or Active Board in your classroom?					

Technology Support

	Yes	No	Don't know
The media specialist at my school provides me with ideas on how to integrate technology within my classroom.			
I have a technology support person (not including the media specialist) with an office in my school to help me with technology integration ideas for my classroom.			
I have a technology support person who serves multiple schools, including my school, who can provide me with ideas on how to integrate technology in my classroom.			
My school district offers many technology related staff development opportunities so I can grow professionally in the area of technology integration.			
Technology related staff development in my school district includes follow up support after the training class to support me with technology integration within my classroom.			
The media specialist at my school has helped me teach and/or modeled teaching a technology related lesson to my students (ex: how to search the library data base, how to use internet resources, how to use a software program).			
The district technology support person assigned to multiple schools including my school has helped me teach and/or modeled teaching a technology related lesson to my students (ex: how to search the library data base, how to use internet resources, how to use a software program).			
My school website offers many useful links which support the curriculum that my students and I can use for instructional purposes.			

Technology Support Continued – total times, not just this school year

	never	1-2 times	3-4 Times	4-6 times	6+ Times
A technology support person has taught/modeled a lesson in my classroom.					
A fellow teacher has taught/modeled a lesson in my classroom.					
A media specialist has taught/modeled a lesson in my classroom.					
A technology support person has assisted me while I taught a technology integrated lesson in my classroom.					
A fellow teacher has assisted me while I taught a technology integrated lesson in my classroom.					
A media specialist has assisted me while I taught a technology integrated lesson in my classroom.					
I feel like I have access to technology integration support when ever I need it so I can effectively integrate technology in my classroom.					
I feel like I do not have the technology integration support/help that I need to effectively integrate technology in my classroom.					

Technology Support continued

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
I often feel frustrated with technology and wish I had more support with learning to integrate technology more effectively.					
When I have a technology related question, I can quickly find someone in my school to help me with my question.					
When technology in my room is not working properly, it is fixed in a timely manner (less complicated issues within a couple days, more complicated issues within a few weeks).					
I wish I had someone to come to my classroom to demonstrate technology rich lessons.					
I know the names of the technology support people who serve my school.					
When I receive technology related support, the people giving support are patient and do not make me feel dumb for not knowing how to do something.					
When I e-mail a technology support person, I get a response quickly.					
District technology integration training I have participated in has been effective in motivating me to integrate technology.					
District technology integration training I have participated in has been effective in teaching me skills needed to integrate technology.					

School Based Support

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
In addition to county staff development opportunities, my school offers technology related staff development.					
Technology integration ideas are shared during faculty meetings and/or other local school meetings at my school.					
The leaders (administrators, etc) demonstrate use of technology when presenting to the faculty at my school.					
Other teachers on my grade level support me with technology integration needs and ideas.					
Teachers in my school help each other with technology integration needs and ideas.					
Technology integration is often part of local school staff development.					
Technology integration is visible at my school.					
Fellow teachers are available to model how to use software applications and/or hardware at my school.					
A large percentage of our school faculty integrates technology on a regular basis.					

Elements of Diffusion

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
I have opportunities to try new technology in my school.					
I have opportunities to observe other teachers integrating technology in their classrooms.					
I have the time I need to plan technology integrated lessons.					
I have access to many technology resources within my classroom.					
I have the opportunity to go to demonstrations of new technology where I can try it out for myself.					
Student work involving technology integration is often printed and hung in the hallways of my school.					
I have the time I need to learn new technology skills.					
I have access to many technology resources which can be checked out from our school media center.					
I have the opportunity to go to technology related conferences to see technology demonstrated.					
I have resources in my school (web page, software help) which cut down on the time I need to plan technology integrated lessons.					
Technology staff development I receive helps simplify technology integration for me.					
I feel frustrated by the complexity of technology when I participate in technology staff development.					

Appendix G

Teacher Open Ended Survey Questions and Interview Questions

Open Ended Survey Questions

Please describe your experiences with the [Name of Program] Initiative

How has this technology teacher development experience been different from other technology staff developments you have taken?

What has been your experiences with support during the [Name of Program] initiative?

How has the [Name of Program] initiative impacted your technology integration and teaching in general?

Interview Questions

1. How has this technology support/teacher development experience been different from other technology staff developments you have taken? What elements do you feel have been the most beneficial? How has it been better or worse than other technology staff developments? Provide an example if possible.
2. Has [Name of Program] impacted your use of technology and/or reduced your anxiety/stress level while working with technology? How? Provide an example if possible.
3. Describe the various ways people who provide support to you during the [Name of Program] initiative have given support. Has their support impacted your teaching and/or made you more willing to try new things? What kinds of support are most helpful to you?
4. Has your use of technology with your class inspired anyone else in your school to do a similar lesson?
5. The most helpful thing for me during this experience has been: (what and explain why)
6. Please share a few thoughts about how this experience has impacted students and any positive/frustrating experiences that came about due to this experience.
7. I feel the following things limit me from using technology more frequently:
8. I would feel more empowered to use technology if I was better supported in the following ways:

Appendix H

Project Director Qualitative Interview

1. How has this technology support/teacher development experience been different from other technology staff developments you have offered teachers? What elements do you feel have been the most beneficial to teachers? How has it been better or worse than other technology staff developments? Provide an example if possible.
2. How has [Name of Program] impacted teachers' use of technology within the district?
3. Have non [Name of Program] teachers started inquiring about how they can become a [Name of Program] classroom?
4. Describe the various ways people who provide support for the [Name of Program] initiative have given support.
5. What are the most common frustrations of teachers within the initiative?
6. What are the most common benefits of the initiative that teachers talk about?
7. How did the district go about designing the initiative? What influenced the program the most?

Appendix I

Consent Forms

Online Survey Consent Form

Georgia State University
Department of Early Childhood Education
Informed Consent

Title: TEACHERS' EXPERIENCES WITH TECHNOLOGY PROFESSIONAL DEVELOPMENT AND CLASSROOM TECHNOLOGY INTEGRATION: INFLUENCES OF ELEMENTS OF DIFFUSION AND SUPPORT

Principal Investigator: Frances LeAnna Bryant and Advisor Olga Jarrett

I. Purpose:
You are invited to participate in a research study. The purpose of the study is to investigate teachers' experiences with technology staff development. You are invited to participate because you are enrolled in the [NAME OF PROGRAM] initiative of [Name of District] County Schools. A total of 131 possible participants in an online survey will be recruited for this study. Participation will require 30 minutes of your time.

This study is a dissertation study examining teachers' experiences with technology staff development. It is hoped that what is learned from the data collected in this study can be used to aid school districts in designing effective teacher staff development related to technology.

II. Procedures:

If you decide to participate, you will complete an online survey at your convenience during the months of May - August 2007. The survey should take between 20-30 minutes. Participants' responses will be kept anonymous.

III. Risks:

In this study, you will not have any more risks than you would in a normal day of life.

IV. Benefits:

Participation in this study may benefit you personally by improving the quality of staff development available for you. Overall, we hope to gain information about elements which make for an effective technology staff development program.

V. Voluntary Participation and Withdrawal:

Participation in research is voluntary. You do not have to be in this study. If you decide to be in the study and change your mind, you have the right to drop out at any time. You may skip questions or stop participating at any time. Whatever you decide, you will not lose any benefits to which you are otherwise entitled.

VI. Confidentiality:

We will keep your records private to the extent allowed by law. Only Frances LeAnna Bryant will have access to the information you provide. It will be stored electronically on the researcher's home computer and at the completion of the study burned to a CD. Data collected via Survey Monkey will be kept as secure as possible by the researcher when downloading data from the survey site to analysis software. Participant names will be removed from all data sources after initial data analysis and before storage. Your name and other facts that might point to you will not appear when we present this study or publish its results. The findings will be summarized and reported in group form. You will not be identified personally.

VII. Contact Persons:

Call Frances LeAnna Bryant at 770-948-0469 or flbteach@hotmail.com if you have questions about this study. If you have questions or concerns about your rights as a participant in this research study, you may contact Susan Vogtner in the Office of Research Integrity at 404-463-0674 or svogtner1@gsu.edu.

VIII. Copy of Consent Form to Subject:

We will give you a copy of this consent form to keep.

If you are willing to volunteer for this research, please continue with the survey

Georgia State University
Department of Early Childhood Education

Oral Interview Informed Consent

Title: TEACHERS' EXPERIENCES WITH TECHNOLOGY PROFESSIONAL DEVELOPMENT AND CLASSROOM TECHNOLOGY INTEGRATION: INFLUENCES OF ELEMENTS OF DIFFUSION AND SUPPORT

Principal Investigators: Student Principal Investigator Frances LeAnna Bryant
Faculty Supervisor Olga S. Jarrett, PhD

I. Purpose:

You are invited to participate in a research study. The purpose of the study is to investigate teachers' experiences with technology staff development. You are invited to participate because you are an elementary teacher enrolled in the [NAME OF PROGRAM] initiative of [Name of District] County Schools. You are one of 16 teachers being asked to participate in oral interviews. Participation will require 30 to 60 minutes of your time.

This is a dissertation study examining teachers' experiences with technology staff development. It is hoped that what is learned from the data collected in this study will be used to aid school districts in designing effective staff development related to technology.

II. Procedures:

If you agree to participate, you will share your experiences in an oral interview, which will be audio recorded, transcribed, and coded. The researcher will meet you at a location convenient for you and the interview should not last more than one hour. Transcriptions of oral interviews will be e-mailed to interviewees for their review after they are transcribed. The researcher will code selected teachers' professional development web pages. This requires no additional time from participants as these are already live internet documents which the researcher can access. Themes apparent in coded interviews will be e-mailed to participants after coding for member checking. In addition, the researcher requests that you complete the online survey part of this study so that qualitative and quantitative data can be linked for deeper understanding of teachers' staff development experiences. The online survey should take no longer than 30 minutes. Participants' responses will be kept confidential.

III. Risks:

In this study, you will not have any more risks than you would in a normal day of life.

IV. Benefits:

Participation in this study may benefit you personally by improving the quality of staff development available for you. Overall, we hope to gain information about elements which make for an effective technology staff development program.

V. Voluntary Participation and Withdrawal:

Participation in this research is voluntary. You do not have to be in this study. If you decide to be in the study and change your mind, you have the right to drop out at any time. You may skip questions or stop participating at any time. Whatever you decide, you will not lose any benefits to which you are otherwise entitled and you will not be treated any differently in the staff development program.

VI. Confidentiality:

We will keep your records private to the extent allowed by law. Only the researchers will have access to the information you provide. It will be stored electronically on Frances LeAnna Bryant's home computer. Participant names will be replaced with codes on all data sources after initial data analysis and before storage on a CD and removal from the researcher's hard drive. The codes will identify multiple data sources from the same person and names will not be stored in any fashion after initial data analysis. Your name and other facts that might point to you will not appear when we present this study or publish its results. The findings will be summarized and reported in group form.

VII. Contact Persons:

Contact Frances LeAnna Bryant at 770-948-0469 or flbteach@hotmail.com or Dr. Olga S. Jarrett at (404) 651-2584 if you have questions about this study. If you have questions or concerns about your rights as a participant in this research study, you may contact Susan Vogtner in the Office of Research Integrity at 404-463-0674 or svogtner1@gsu.edu.

VIII. Copy of Consent Form to Subject:

We will give you a copy of this consent form to keep.

If you are willing to volunteer for this research, be audio recorded, and allow for analysis of your teacher development web site, please sign below.

_____	_____
Participant	Date
_____	_____
Principal Investigator or Researcher Obtaining Consent	Date

Georgia State University
Department of Early Childhood Education
Program Director Interview Informed Consent

Title: TEACHERS' EXPERIENCES WITH TECHNOLOGY PROFESSIONAL DEVELOPMENT AND CLASSROOM TECHNOLOGY INTEGRATION INFLUENCES OF ELEMENTS OF DIFFUSION AND SUPPORT

Principal Investigators: Student Principal Investigator Frances LeAnna Bryant
Faculty Supervisor Olga S. Jarrett, PhD

I. Purpose:

You are invited to participate in a research study. The purpose of the study is to investigate teachers' experiences with technology staff development. You are invited to participate because you are the director of the [NAME OF PROGRAM] initiative of [Name of District] County Schools. Participation will require 60 minutes of your time.

This is a dissertation study examining teachers' experiences with technology staff development. It is hoped that what is learned from the data collected in this study will be used to aid school districts in designing effective staff development related to technology.

II. Procedures:

If you agree to participate, you will share your experiences as program director in an oral interview, which will be audio recorded, transcribed, and coded. The researcher will meet you at a location convenient for you and the interview should not last more than one hour. Transcriptions of oral interviews will be provided to interviewees for their review. Participants' responses will be kept confidential.

III. Risks:

In this study, you will not have any more risks than you would in a normal day of life.

IV. Benefits:

Participation in this study may benefit you personally by providing a deeper understanding of how teachers are experiencing the staff development program which you direct. Overall, we hope to gain information about elements which make for an effective technology staff development program.

V. Voluntary Participation and Withdrawal:

Participation in this research is voluntary. You do not have to be in this study. If you decide to be in the study and change your mind, you have the right to drop out at any time. You may skip questions or stop participating at any time. Whatever you decide, you will not lose any benefits to which you are otherwise entitled and you will not be treated any differently in the staff development program.

VI. Confidentiality:

We will keep your records private to the extent allowed by law. Only the researchers will have access to the information you provide. It will be stored electronically on Frances LeAnna Bryant's home computer. Participant names will be replaced with codes on all data sources after initial data analysis and before storage on a CD and removal from the researcher's hard drive. The codes will identify multiple data sources from the same person and names will not be stored in any fashion after initial data analysis. Your name and other facts that might point to you will not appear when we present this study or publish its results. The findings will be summarized and your name will not appear in any reporting to protect your identity.

VII. Contact Persons:

Contact Frances LeAnna Bryant at 770-948-0469 or flbteach@hotmail.com or Dr. Olga S. Jarrett at (404) 651-2584 if you have questions about this study. If you have questions or concerns about your rights as a participant in this research study, you may contact Susan Vogtner in the Office of Research Integrity at 404-463-0674 or svogtner1@gsu.edu.

VIII. Copy of Consent Form to Subject:

We will give you a copy of this consent form to keep.

If you are willing to volunteer for this research, be audio recorded, and allow for analysis of your teacher development web site, please sign below.

_____ _____

Participant Date

_____ _____

Principal Investigator or Researcher Obtaining Consent Date